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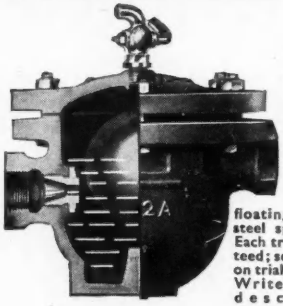

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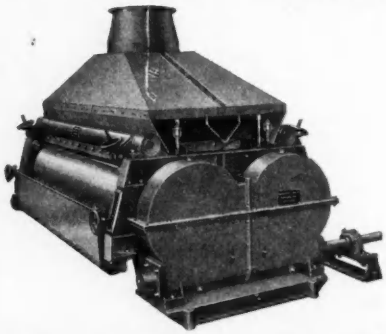

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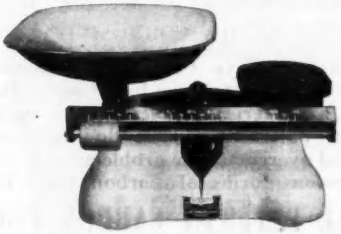

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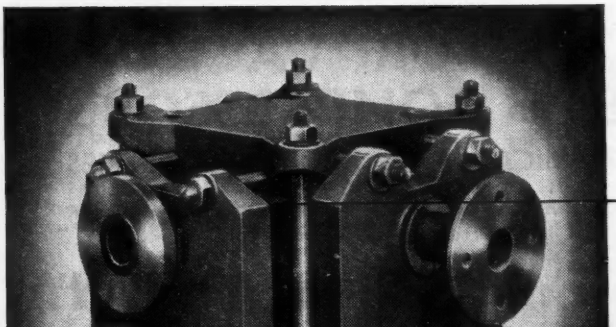

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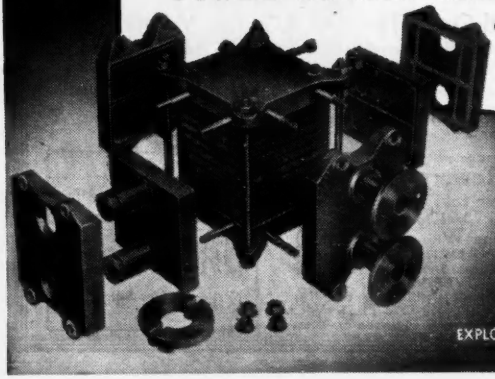

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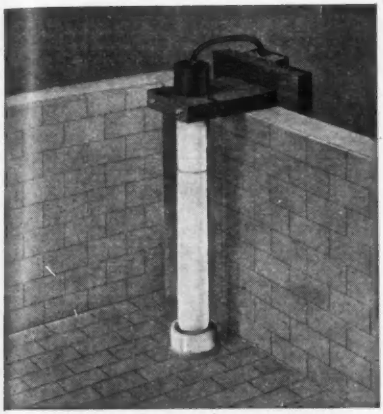

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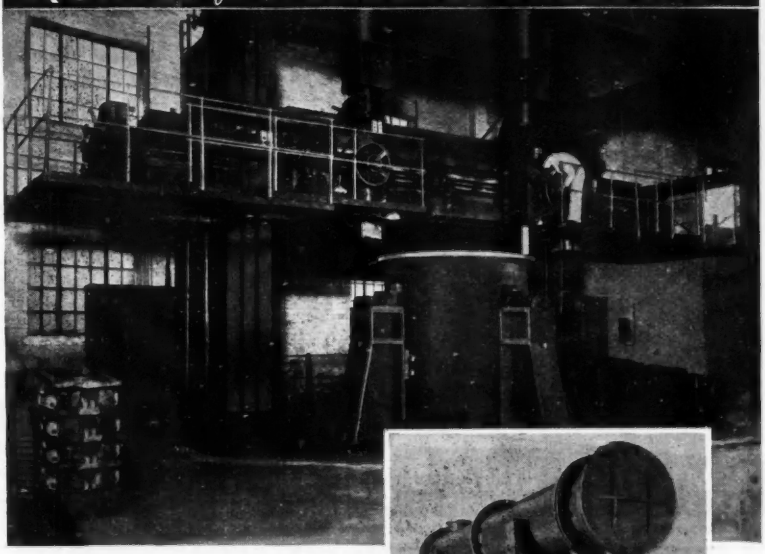

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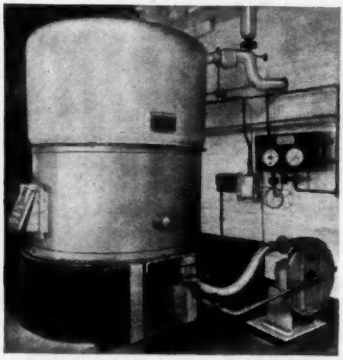

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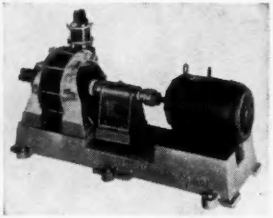

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Volume LXIV 27 January 1951 Number 1646

DDT in Perspective

SIX years ago DDT was a "philosopher's stone" among the insecticides, or, to continue the metaphor, an "elixir of death" for all insects that prey upon man and his food, clothes, and shelter. From those early and inflated heights of publicity DDT has fallen. In certain fields of insect control shortcomings have gradually emerged. The humble house fly can develop resistance. DDT residues on forage or fodder crops may be minute in quantity but they accumulate in the fat of animals feeding on the treated produce; and such accumulation may result in disturbingly high DDT concentrations in milk, butter, or cream. As a foliage spray for pest control in horticulture the very durability of DDT residues is a disadvantage; for, after the target pests have been killed in their season, other insects that are beneficial may also be killed. The use of DDT in apple pest control has steadily brought increases in red spider infestation—because the beneficial insects that prey upon red spiders are killed by DDT while the red spider mites themselves are unaffected. Despite DDT's effectiveness as an insecticide for some pests it is now realised to be relatively ineffective for the aphid class, perhaps the most troublesome garden pests of all.

There is now, as a result, some tendency to decry DDT. Whenever the mighty are found to be rather less all-powerful than their reputations, public reaction is apt to be subjective rather than objective. In that hot-bed and forcing-house for new agricultural chemicals, the United States, some advertisements in the past two years have claimed as a notable selling-point the fact that this or that general insecticide does *not* contain DDT. Not so long ago it was said that house-flies in DDT-treated buildings had become so resistant that the only way left to kill them was to hit them with a hammer. The early champions of DDT who led the public to expect far too much from a single substance must take a good deal of the blame for the "slump" in DDT's reputation. Moreover, it is an unwarranted slump. Side by side with the emergence of these limitations as a universal insecticide DDT has been achieving great successes in the fields of pest control for which it is particularly fitted. All too little attention has been paid to these notable advances.

In two years DDT has made an outstanding contribution towards increased food production in the East Bengal Province of Pakistan. To expand food production in parts of the world where nutritional standards

most require raising is far more important than adding two or three per cent to crop yields in countries whose food supplies are adequate or abundant. It is not, however, as a crop pest killer that DDT has made its contribution to food production in the East. It is by indirect action, by the suppression of malaria, that DDT has boosted Pakistan's rice tonnage. Tests showed that the rice output from sprayed fields was 15 per cent greater than that from unsprayed fields. The man hours of labour required in the total operation of rice growing were reduced by 10 per cent. Apart from the better man-hour effort obtained from workers through DDT's control of the malaria-carrying mosquito, actual loss of hours was reduced by more than 2 per cent. 193 square miles were sprayed in 1950. No malaria cases occurred among babies up to the age of one year in the sprayed regions but the incidence of malaria among babies in untreated regions was 7.1 per cent.

These recently reported results may be compared with earlier and similar results from Cyprus. On that island, oppressed for centuries by malaria, a total spraying operation was conducted. Every possible breeding-place for the mosquito was sought out and treated with DDT; places that were humanly inaccessible by reason of height were attacked with "Gammexane" smokes. In the first year of this campaign, 1947, the usual number of malaria cases per annum was reduced from 18,000 to 2000. In 1948 the figures had fallen to 400; in 1949 there were only just over 100 cases. Infant mortality, mainly due to malaria, fell from 180 per 1000 births to 70. The cost of this operation was £300,000 or 13s. per head of the island's population.

No insecticidal substance can be universal in its powers. Indeed, in the strategy of crop insect control, with the need to balance the claims of the destructive and beneficial insects, it is far better that each substance should have its clear-cut limitations. DDT will find its established place in pest control for the protection of growing crops; its limitations have in any case stimulated the development of many new synthetic insecticides, e.g., methoxychlor, chlordane, etc. In large-scale "sanitary" control DDT has achieved unprecedented triumphs. Its lasting contact effect and its cheapness have enabled such enemies of man as the malaria-carrying mosquitoes to be attacked with widespread intensity. The success story of DDT in Cyprus and in East Bengal far outweighs the few disappointments that have been experienced in its post-war development.

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Notes and Comments

Chemicals' Record Year

EACH year since 1947 the value of chemical exports has steadily risen, culminating last year in a total of £107.4 million, compared with £86 million in 1949. This great contribution by the industry towards the nation's economic recovery has been partly due to the increasing trade within the Commonwealth, which was exemplified in the following comparisons (in millions): Australia £6.9 (£4.7); Canada £3.8 (£1.6); Pakistan £3.1 (£2.4). One remarkable feature was the increase of exports to the U.S.A. by £3.94 million to £5.8 million. Such a satisfactory record is, unfortunately, not likely to be within the possibility of attainment this year. Shortage of raw materials and other problems are, indeed, already beginning to be felt and exports are bound to suffer as home markets have to be given first consideration. With the attainments of the last few years to show what can be achieved, the chemical industry may, however, well face the difficulties of 1951 with confidence.

Bottle Washing

FOR somewhat obscure reasons bottle washing has acquired a phraseological atmosphere of indignity. Yet it is an important task of civilisation's routine affecting every member of the public. Dairies, breweries, and mineral water manufacturers are the largest washers of bottles, and in this operation they consume large amounts of chemicals. A recent American survey has shown how enormously this use of chemicals has increased since the beginning of the century. In the U.S.A. some 4000 tons of alkali were used per year at the end of the nineteenth century; today the figure has risen to 38,000 tons. No doubt similar expansion has taken place here. Caustic soda would seem to have maintained its major position as the principal cleansing agent of bottles. It possesses three advantages—cleaning efficiency, sterilising value, and good lubricating effect upon the under-water and moving parts of bottle-washing machines. It has, however, two disabilities. It is not freely rinsable and it tends to cause heavy scale deposition in hard water districts. The modern washing compound includes other detergent materials that offset these limitations. Thus, the softening virtues of the various sodium phosphates have been increasingly blended with the powerful cleaning property of caustic soda. Sodium triphosphate, tetra-sodium pyrophosphate, and, more recently, sodium tripolyphosphate have become important washing compound ingredients. These added substances bring "rinsability" and they deposit a less troublesome scale from hard water. The surface-active wetting agents of synthetic origin are also invading this field. The ideal bottle-washing compound has probably yet to be formulated. It must be rapid in action, free rinsing, non-foaming, non-corrosive, non-scaling, bactericidal and it must be cheap! Such total specifications generally remain producers' headaches and consumers' dreams. However, the cost and efficiency of bottle-washing as a combined chemical and mechanical operation will play an important part in the packaging battle between re-useable glass bottles and single-use cartons or tins, especially in the dairy industry. Furthermore, since bottle washing consumes such large tonnages of caustic soda and sodium carbonate, the steady improvement of washing compounds is far from unimportant in the maintenance of this regular market for alkali.

Harwell Isotopes

AS is well known, the most peaceable product of atomic fission is the radio-isotope or tracer-element as a weapon of research. Last week's statement from the Ministry of Supply that Britain leads the world in providing radio-isotopes for research—with a 1950 export figure of 1291 consignments—seemed a most encouraging demonstration that we could still keep ahead in technical developments.

But was it in fact a sign of this? The importance of the radio-isotope lies not so much in its production as in its use. The export of these important substances may be likened to the export of machine-tools and before it can be considered praiseworthy to have exported 1291 isotope parcels the comparable figure for supply to our own research establishments must be known. An American figure for radio-isotopes despatched from the Oak Ridge pile is 12,000 consignments to more than 750 research centres. Although this represents a period of more than a year, it is a figure that dwarfs our own 1950 export total. And, if 1291 export consignments is, as claimed, a world record for any one country, it is clearly indicated that America's output of these research tools is largely utilised in America. We may well be forgetting that research, like charity, begins at home. However, even in the United States, the use of these isotopes in industrial research has been slow to develop. It is said that less than 4 per cent of the 12,000 Oak Ridge consignments went to industrial research laboratories. Medical and biological research stations dominate the picture. It is reported that industry is reluctant to adopt the use of tracer-elements because of the high initial cost of equipment, the need to train personnel, and through fear of radiation hazards. Nevertheless, enormous and diverse opportunities exist for the profitable employment of radio-isotopes in industry, not merely in new research but in the control testing of existing processes. When it is read that ordinary flies have been "tagged" with radio-isotopic phosphorus in order to study the distances they fly, it is clear that experience in the use of radio-active substances in biological research has developed a wide margin of safety. As Harwell has been able to break the world's record for exporting isotopes, it would be interesting to know if British industry is also taking the lead in developing their use. The American figure—under 4 per cent of 12,000 consignments, which is an indication of some 450 despatches to industry—shows that this technological field is still wide open.

Pity the Chemist

PITY the poor chemist! His investigations and discoveries all too frequently result in his condemnation. In some cases this is not directly the fault of the men who originally commenced the work for often the results of his labour are put to uses other than those which he had intended. They are applied in other directions for which, in the mind of the lay public, he is held responsible. As long ago as 1915 Dr. L. H. Baekeland in an address to the American Chemical Society in Seattle said: "Do not reproach chemistry with the fact that nitrocellulose, of which the first application was to heal wounds and to advance the art of photography, was stolen away from these ultra-pacific purposes for making smokeless powder and loading torpedoes. Do not curse the chemist, when phenol, which revolutionised surgery, turned from a blessing to humanity into a fearful explosive when it had been discovered that nitration changed it into picric acid." There are, of course, many other examples, including the development of nuclear fission in the production of the atomic bomb before its use as a source of beneficial power. There is, however, a lighter aspect to the charges against the chemist as recorded last week in one of the "popular" dailies, and in this case the chemists concerned must bear full responsibility. The human flea (according to the newspapers) is apparently becoming increasingly hard to get owing to the newer insecticides and disinfectants. This species of flea is alleged to be the only one capable of training—the female incidentally being the stronger and more intelligent—with the result that the owner of a flea-circus is contemplating switching over to training elephants!

EXPORTS AND IMPORTS IN 1950

Chemical Industry's Part in Overseas Trade

CHEMICAL exports in 1950 again made a valuable contribution to the overseas markets of the United Kingdom, with a new record total for the year of £107,432,727, compared with £86,063,774 in 1949, and £83,546,870.

Details of the export and import figures for December and for the year ended 31 December, 1950, compared with the same periods of 1949, abstracted from the *Trade and Navigation Accounts of the United Kingdom*, December, 1950 (HMSO, 6s. 6d.) are set out below:—

EXPORTS

	Month ended 31 Dec. 1950	Month ended 31 Dec. 1949	Year ended 31 Dec. 1950	Year ended 31 Dec. 1949
Cresylic acid	Gal. 397,472	Gal. 177,202	Gal. 3,375,410	Gal. 1,445,707
Salicylic acid and salicylates	Lb. 103,186	Lb. 116,192	Lb. 1,526,588	Lb. 2,077,896
Value of all other sorts of acid	£153,923	£126,506	£1,976,855	£1,431,190
Sulphate of alumina	Tons 2,050	Tons 2,605	Tons 34,272	Tons 33,287
All other sorts of aluminium compounds	2,472	986	18,638	15,666
Ammonium sulphate	25,312	15,668	277,085	262,142
Ammonium nitrate	8,050	4,658	58,570	67,614
All other sorts of ammonium compounds	1,278	1,214	20,369	17,481
Bleaching powder	Cwt. 27,612	Cwt. 13,652	Cwt. 273,272	Cwt. 319,078
All other bleaching materials	12,301	11,180	137,028	114,437
Collodion cotton (nitro-cellulose), wet	1,976	923	26,404	25,930
Copper sulphate	Tons 3,507	Tons 1,612	Tons 54,895	Tons 38,267
Disinfectants, insecticides, etc.	Cwt. 41,625	Cwt. 36,833	Cwt. 491,191	Cwt. 524,661
Fertilisers	Tons 5,502	Tons 3,845	Tons 30,188	Tons 24,730
Value of gases (compressed, liquefied, or solidified)	£30,632	£16,521	£349,906	£271,244
Lead acetate, litharge, red lead, etc.	Cwt. 9,035	Cwt. 5,618	Cwt. 128,888	Cwt. 70,356
Tetra ethyl lead	Gal. 119,474	Gal. 112,862	Gal. 1,439,023	Gal. 1,360,890
Magnesium compounds	Tons 702	Tons 562	Tons 10,569	Tons 8,572
Nickel salts	Cwt. 1,771	Cwt. 3,920	Cwt. 65,327	Cwt. 54,406
Potassium compounds	9,152	5,699	91,708	68,799
Salt	Tons 29,423	Tons 18,278	Tons 260,557	Tons 215,834
Sodium, carbonate	Cwt. 466,154	Cwt. 257,357	Cwt. 4,891,735	Cwt. 3,430,442
Caustic soda	223,271	252,540	3,546,637	2,281,859
Sodium silicate	19,653	21,131	327,013	299,211
Sodium sulphate	25,558	92,854	697,932	667,756
All other sodium compounds	89,285	89,695	1,059,451	922,116
Tar oil, creosote oil, anthracene oil, etc.	Gal. 694,152	Gal. 3,859,388	Gal. 28,737,345	Gal. 35,371,852
Zinc oxide	Tons 601	Tons 828	Tons 13,540	Tons 12,444
Total value of chemical manufactures, excluding dyes and dyestuffs	£5,486,100	£3,888,325	£60,441,381	£45,948,325
Acetyl-salicylic acid	Lb. 193,178	Lb. 134,468	Lb. 2,439,974	Lb. 1,729,169
Insulin	100 I.U. 1,010,182	100 I.U. 800,913	100 I.U. 11,795,099	100 I.U. 12,066,398
Penicillin	Mega Units 1,527,026	Mega Units 899,261	Mega Units 13,701,429	Mega Units 7,587,339
Total value of drugs, medicines and preparations	£2,036,344	£1,587,859	£22,330,037	£18,366,503
Total value of dyes and dyestuffs	£1,088,801	£644,471	£10,793,388	£9,959,131
Total value of paints, pigments, colours, etc.	£1,243,478	£921,194	£13,867,921	£11,789,725
Total value of chemicals, drugs, dyes and colours	£9,854,723	£7,041,849	£107,432,727	£86,063,774
Plastic materials	Cwt. 70,143	Cwt. 41,014	Cwt. 706,120	Cwt. 414,136
Value	£951,463	£512,000	£9,129,285	£5,158,206
Chemical glassware	Cwt. 1,544	Cwt. 1,404	Cwt. 16,540	Cwt. 14,544
Value	£58,040	£54,505	£629,360	£568,417

	Cwt.	Cwt.	Cwt.	Cwt.
Fans	3,823	7,126	56,048	55,841
Value	£98,003	£160,909	£1,483,877	£1,532,559
	Cwt.	Cwt.	Cwt.	Cwt.
Furnace plant	6,989	9,611	110,633	86,084
Value	£81,923	£127,719	£1,311,949	£1,707,102
	Cwt.	Cwt.	Cwt.	Cwt.
Gas and chemical machinery	19,990	19,960	253,711	311,831
Value	£214,890	£237,850	£3,143,041	£3,713,285
	Cwt.	Cwt.	Cwt.	Cwt.
Air and gas compressors and exhausters	14,818	14,396	188,467	146,398
Value	£317,696	£290,903	£3,802,696	£3,023,846
Total value of non-ferrous metal group	£6,963,921	£5,554,169	£76,914,075	£63,604,152

IMPORTS

	Month ended 31 Dec. 1950	Month ended 31 Dec. 1949	Year ended 31 Dec. 1950	Year ended 31 Dec. 1949
	Cwt.	Cwt.	Cwt.	Cwt.
Acetic anhydride	3,012	12,004	77,889	99,374
Acetic acid	787	—	787	22,020
Boric acid	2,930	3,250	94,468	62,859
Carbolic acid	591	—	30,113	18,365
Value of all other sorts of acid	£52,711	£34,476	£744,653	£541,400
	Cwt.	Cwt.	Cwt.	Cwt.
Borax	20,600	12,200	280,561	217,902
Calcium carbide	29,900	—	93,129	47,578
Cobalt oxides	268	268	5,137	5,721
	Tons	Tons	Tons	Tons
Fertilisers	27,394	4,929	168,687	88,271
	Lb.	Lb.	Lb.	Lb.
Glycol ethers and glycol ether-esters	502,625	433,822	5,909,836	5,365,437
Iodine	264,511	75,050	869,483	753,151
	Cwt.	Cwt.	Cwt.	Cwt.
Potassium chloride	539,243	795,569	7,959,651	7,883,868
Potassium sulphate	13,586	21,140	275,395	418,012
All other potassium compounds	8,686	5,747	154,886	69,659
Sodium nitrate	18,113	120,691	353,661	893,914
All other sodium compounds	21,647	4,940	181,828	60,951
	Cwt.	Cwt.	Cwt.	Cwt.
Carbon blacks (from natural gas)	31,451	64,286	867,190	562,447
Value	£135,446	£263,623	£3,596,749	£1,981,810
Total value of chemicals, drugs, dyes and colours	£3,393,550	£2,454,097	£36,210,176	£25,319,284
	Tons	Tons	Tons	Tons
Sulphur	26,768	30,300	439,311	392,924
Value	£296,905	£287,098	£4,397,362	£3,405,373

Dependence Unsatisfactory

THE twenty-third annual general meeting of Scottish Agricultural Industries, Ltd., was held in Edinburgh on 18 January.

In the course of his address, the chairman, Dr. Alexander Fleck, emphasised the importance of conserving the resources of the company during an inflationary period. The year had been a good one; the turnover had exceeded £15 million and it had been possible to make a reasonable contribution towards the much increased costs of replacing physical capital assets.

The outlook for the current year was clouded by the international situation and by the uncertainties of raw materials supplies. In many branches of the business of S.A.I. difficulties were being encountered owing to deficiencies of supply and inflated costs of raw material.

In his concluding remarks Dr. Fleck referred to the present world shortage of sulphur. The consequent shortage of sulphuric acid in the United Kingdom has led to a marked reduction in superphosphate production. The Board of Trade were importing superphosphate from the Continent to supplement the diminished home output, but dependence on costly imports was unsatisfactory and led to great distribution difficulties in the busy spring sowing season. Dr. Fleck pointed out that these developments were having a very serious effect on costs, and that fertiliser prices after final removal of the Board of Trade subsidies on 30 June, 1951, would be much higher than was expected at the time it was decided to abolish these subsidies. It was to be hoped that the difficulties arising from the sulphur shortage would be overcome in due course by installation of sulphuric acid plants using other sulphur-bearing raw materials and by the development of phosphatic fertilisers which did not require sulphuric acid in their manufacture.

Orthoformic Esters

THE orthoformates comprise a group of esters which find varied industrial application. Their application depends primarily on their reactivity, and this reactivity in turn derives from the instability of their parent acid. In fact,

orthoformic acid $HC(OH)_3$ is unknown

in the free state as are also its homologues

$RC(OH)_3$, and this instability of the acids

confers a high degree of reactivity on the corresponding esters. The relation that the orthoformates bear to the normal formates is as follows:

$H.C(=O)(OR)$	$H.C(OR)_3$
Normal alkylformate	Trialkyl orthoformate

The orthoformates may be regarded as the acetals of formic esters; the orthoformates bear the same relation to the formates as do the acetals to the aldehydes.

$$R.CHO + 2EtOH \rightarrow R.CH(OEt)_2 + H_2O$$

Aldehyde — Diethyl acetate

$R.C(=O)(OEt)$	$R.C(OEt)_3$
Formate	Triethylorthoformate

But although acetals are made by the addition of alcohol molecules to an aldehyde, the orthoformates cannot be made by the addition of an alcohol to a normal formate.

The classical method of preparing orthoformic esters is by the reaction of sodium alkoxide with chloroform; the chloroform is hydrolysed and the orthoformic ester corresponding to the particular alcohol that was used is so prepared. The reaction is:

$$CHCl_3 + 3NaOR \rightarrow H.C(OR)_3 + 3\,NaCl$$

If, for example, sodium ethoxide (or ethyl alcohol and sodium) is used, then triethyl orthoformate is produced:

$$CHCl_3 + 3NaOEt \rightarrow H.C(OEt)_3 + 3\,NaCl$$

The reaction was discovered by Williamson and Kay[1] as long ago as 1854, at a time, it is interesting to note, when the formulæ of chloroform and sodium ethoxide were believed to be, respectively, C_2HCl_3 and $C_4H_5O_2Na$. In those early days, chemistry as a practical art was ahead of theory.

Their work was followed up by Deutsch[2] who extended the method to the preparation of the following orthoformates:

	Boiling point	*S.G.*
Methyl orthoformate	101-102° C.	0.974
Ethyl orthoformate	145-147° C.	—
Propyl orthoformate	196-198° C.	0.879
Isobutyl orthoformate	220-222° C.	0.861
Isoamyl orthoformate	265-267° C.	0.864

All were oily colourless liquids and the last three were immiscible with water.

As a class, the iminoethers are the enolic forms of the acid amides.

$RCONH_2$	$RC(OH)(=NH)$
Acid amide	Imino ether

They are ordinarily prepared by the addition of an alcohol to a nitrile in the presence of dry hydrogen chloride, according to the equation:

$$RC{\equiv}N + HOEt + HCl \rightarrow R.C(OEt)(=NH.HCl)$$

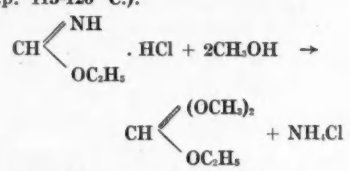
Nitrile — Alcohol — Imino-ether hydrochloride

It was shown by Pinner[3] that formimino ether hydrochloride would react with ethyl alcohol to give triethyl orthoformate, a reaction which he expressed as follows:

$$CH(=NH)(OC_2H_5) . HCl + 2C_2H_5OH = NH_4Cl + CH(OC_2H_5)_3$$

This method clearly offers the possibility of preparing mixed esters of orthoformic acid—a possibility not so easy of attainment with the chloroform method which would certainly produce an un-

wanted mixture of mixed esters if the preparation of a single mixed ester was attempted by means of it. Pinner appreciated the possibilities of his new method, and by reacting formimino ethyl ether hydrochloride with methyl alcohol he was able to make dimethyl ethyl orthoformate (b.p. 115-120° C.).



Later, Pinner[4] made a whole series of mixed orthoformic esters and recorded their boiling points as follows:

	Boiling Point
Dimethyl ethyl orthoformate	116-120° C.
,, propyl ,,	150-155° C.
,, amyl ,,	234-240° C.
Diethyl propyl ,,	165-170° C.
Dipropyl methyl ,,	180-182° C.
,, ethyl ,,	185-187° C.
,, amyl ,,	222-230° C.
Diisobutyl propyl ,,	212-214° C.
,, amyl ,,	230-235° C.
Diamyl ethyl ,,	253-255° C.
,, propyl ,,	254-255° C.

The method which Vogel[5] recommends for the preparation of ethyl orthoformate may be summarised as follows:

One puts

750 ml. " super-dry " ethyl alcohol
82 ml. dry chloroform

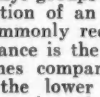
into a 1½ litre flask fitted with a reflux condenser. Then 52 gm. sodium in small pieces is added through the condenser over a period of 30 minutes; the reaction is moderated, if necessary, by running the condenser effluent on to the flask. When all the sodium has reacted and the mixture cooled, the sodium chloride which has been formed in the reaction is filtered off in a sintered glass funnel. The filtration apparatus must be kept dry by means of a tube filled with cotton wool between flask and pump. The solid on the funnel is washed with 50 ml. absolute alcohol. The filtrate is distilled from a water-bath using a fractionating column to recover any unchanged chloroform and most of the alcohol. The distillate, 500 ml., is collected and used again for a second run; the residue is decanted from salt which has separated and distilled from a Claisen flask with fractionating side-arm. A low-boiling fraction first passed over and then the triethyl orthoformate at 144-146° C. The yield is about 35 grammes; the theoretical yield from 82 grammes of chloroform is $82 \times \frac{148}{119.5}$ = 101 g., so that the yield is rather less than 35 per cent. Even so, this compares favourably with industrial preparations of orthoformic ester in which frequently the yield is as low as 25 per cent. Probably the reasons for the low yield which is invariably obtained are:

(1) Decomposition of the orthoformate to the normal formate.

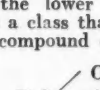
(2) Reduction of some of the chloroform to methane which would be lost as fast as it formed, so that the condition would always be suitable for its production.

If this second reason is of considerable importance in the manufacture of orthoformic esters, then it should be possible very considerably to increase the yield obtained by carrying out the reaction under a blanket of methane, preferably of methane under pressure. In fact, the use of pressure alone, irrespective of the chemical nature of the gas which provided it, should enhance the yield, by suppressing the generation of gaseous by-products.

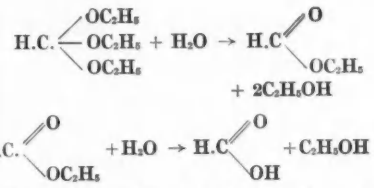
The orthoformates are sufficiently stable for distillation and are used on an industrial scale in synthetic chemistry, despite the fact that their parent acid, orthoformic acid, cannot be isolated. The greater stability of the esters is due to the loading of the hydroxyl groups with alkyl groups. The substitution of an alkyl group for a hydrogen commonly reduced reactivity; a familiar instance is the reduced reactivity of the ketones compared with the aldehydes and the lower reactivity of the aldehydes as a class than of formaldehyde itself. The compound ethyl orthoformate



is stable, but orthoformic acid

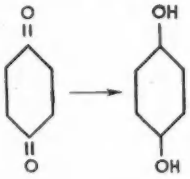


immediately loses water to give formic acid . The orthoformic esters are very stable towards alkalis, but are readily hydrolysed by acids, *e.g.*, ethyl orthoformate is hydrolysed successively to ethyl formate and to formic acid:



The orthoformic esters have pleasant ester-like smells.

Ethyl orthoformate has been shown by Mustafa[6] to act as a photochemical reducing agent in sunlight. When *p*-benzoquinone and ethyl orthoformate were exposed in sealed Pyrex tube to sunlight, hydroquinone was formed; the fate of the orthoformic ester was not, however, determined. In sunlight the reaction was:



In the dark there was no reaction. Similarly ethyl orthoformate converted phenanthraquinone in sunlight into 9:10-dihydroxyphenanthrene, whereas in the dark there was no reaction at all. These observations seem to establish the photochemical activity of ethyl orthoformate.

It should be noted that commercial ethyl orthoformate is sometimes found to contain large amounts of ethanol and this must first be removed by fractional distillation before the ester can be used satisfactorily in many of the reactions to be described.

Post and Erickson[7] set out to investigate the relative reactivities of some alcoholates of simple aliphatic alcohols; their general procedure was to mix a given amount of chloroform with a mixture of equal quantities of two different alcoholates and determine the identity of the products. Then if a mixture of two alcoholates NaOR and $NaOR^1$ was used the expected reaction would be:

$CHCl_3 + 3NaOR \rightarrow CH(OR)_3 + 3NaCl$
$CHCl_3 + 3NaOR^1 \rightarrow CH(OR^1)_3 + 3NaCl$

As an insufficiency (for complete reaction) of the chloroform was used, the more reactive of the two alcoholates might reasonably be expected to react with the greater part of the available chloroform and so produce correspondingly more of the orthoformic ester. If, for example, the alcoholate NaOR was more reactive than $NaOR^1$ it would be expected that more of the orthoformate $HC(OR)_3$ would be formed than of the corresponding $HC(OR^1)_3$.

In fact it was found that as soon as the two expected orthoformates were prepared, an equilibrium was set up at room temperature; the equilibrium reaction consisted of the interconversion of all four possible mixed esters. If, for example, a mixture of sodium ethoxide and sodium butoxide was used, the two expected esters

Triethyl orthoformate	$HC(OC_2H_5)_3$ 12.6 per cent
Tributyl orthoformate	$HC(OC_4H_9)_3$ 9.4 per cent

were produced but, in addition, there were also found:

Diethyl butyl orthoformate	$HC(OC_2H_5)_2OC_4H_9$ 42.1 per cent
Ethyl dibutyl orthoformate	$HC(OC_2H_5)(OC_4H_9)_2$ 35.9 per cent

As will be seen from the yield figures, considerably more of the mixed than of the simple esters were formed.

Post and Erickson expressed this radical interchange by the following equation:

$$HC(OR)_3 + HC(OR^1)_3 \rightleftarrows HC(OR)_2OR + HC(OR^1)_2OR$$

Tripropyl orthoformate reacted with absolute ethyl alcohol to give a mixture of the four possible orthoformates and two alcohols. The yields of the orthoformates were:

Triethyl orthoformate	2.1 per cent
Diethyl propyl orthoformate	42.0 per cent
Ethyl dipropyl ,,	40.0 per cent
Tripropyl ,,	15.9 per cent

In addition, some propyl alcohol was formed.

In another experiment, Post and Erickson allowed ethyl mercaptan to stand in contact with triethyl orthoformate in a sealed tube at room temperature for a week; on distillation some triethyl orthoformate (unchanged) and some monothiotriethyl orthoformate were collected:

$$HC(OC_2H_5)_3 + C_2H_5SH \rightleftarrows C_2H_5OH + HC(OC_2H_5)_2SC_2H_5$$

Interchange of radical was also studied by Mochel, Agre, and Hanford[8], with

particular reference to sulphur compounds.

When ethyl orthothioformate and ethyl alcohol were refluxed for 10 hours with zinc chloride the bulk of the reaction products consisted of ethyl orthoformate and ethyl mercaptan, *i.e.*:—

$$HC(SC_2H_5)_3 + 3C_2H_5OH \rightarrow HC(OC_2H_5)_3 + 3\,C_2H_5SH$$

If, however, butyl alcohol is used instead of ethyl alcohol, the reaction takes a different course and gives in nearly quantitative yield dibutyl ether, butyl formate and ethyl mercaptan.

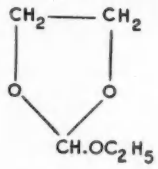
$$HC(SC_2H_5)_3 + 3C_4H_9OH \rightarrow HCO.OC_4H_9 + C_4H_9OC_4H_9 + 3C_2H_5SH$$

Presumably tributyl orthoformate is the first product of the interchange of radical and this decomposes, as fast as it is formed, into dibutyl ether and butyl formate:

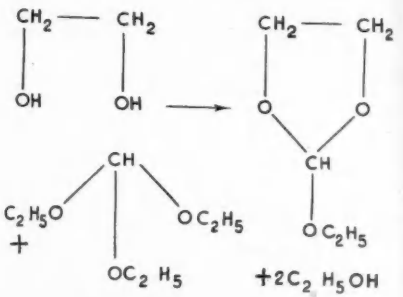
$$HC(OC_4H_9)_3 \rightarrow H.C(=O)OC_4H_9 + C_4H_9OC_4H_9$$

As a practical illustration of the value of radical interchange we may consider the preparation of the bornyl and menthyl orthoformates which has been described by Mkhitaryan[9]. They found that when ethyl orthoformate was heated with menthol or borneol, there was an exchange of one, two or three of the ethoxy groups and the formation of corresponding orthoformates with like and unlike alkyl groups; this exchange was accelerated by *p*-toluenesulphonic acid. Thus a mixture of 15 grammes ethyl orthoformate and 18.9 grammes *dl*-menthol yielded 9.2 grammes of inactive menthyl diethyl orthoformate and 11.5 grammes of the dimenthyl ethyl ester. On heating and exposure to daylight, both of these mixed esters are converted to trimenthyl orthoformate. The menthyl and bornyl esters are surprisingly resistant to the action of alkali, but readily undergo acid hydrolysis.

This work was extended by Mkhitaryan[10] who found that ethyl orthoformate would react with glycol, in the presence of *p*-toluene sulphonic acid to yield 2-ethoxy-1,3 dioxolane of the formula:



If heated with menthol or borneol, the ethoxy group ($-OC_2H_5$) can be replaced by menthyloxy or bornyloxy. The first reaction appears to take place in this way:



It was shown by Dangyan[11] that an orthoformic alkyl ester could be converted to the alkyl iodide by distillation with iodine in the presence of certain metals. Thus the slow distillation of a mixture of 7.7 grammes iodine and 6.8 grammes ethyl orthoformate in the presence of 1.7 grammes powdered iron gave 5.4 grammes ethyl iodide and 3.4 grammes ethylformate. Magnesium, zinc, manganese, and aluminium behave similarly to iron; the reaction is presumably:

$$HC(OC_2H_5)_3 + I_2 + Fe \rightarrow HCOOC_2H_5 + 2C_2H_5I + FeO$$

REFERENCES

[1] Williamson and Kay, *Annalen der Chemie und Pharmacie*, 1854, *92*, 346.
[2] A. Deutsch, *Berichte*, 1879, *12*, 115.
[3] A. Pinner, *ibid.*, 1883, *16*, 356.
[4] A. Pinner, *ibid.*, 1883, *16*, 1647.
[5] A. I. Vogel, "Practical Organic Chemistry," p. 321, London, 1948.
[6] A. Mustafa, *Nature*, 1948, *162*, 856-7.
[7] H. W. Post and E. R. Erickson, *J. Amer. Chem. Soc.*, 1933, *55*, 3851.
[8] W. E. Mochel, C. L. Agre and W. E. Hanford, *ibid.*, 1948, *70*, 2268.
[9] V. G. Mkhitaryan, *J. Gen. Chem. U.S.S.R.*, 1938, *8*, 1361-8, and *Chemical Abstracts*, 1939, *33*, 4222.
[10] V. G. Mkhitaryan, *Chemical Abstracts*, 1940, *34*, 7859.
[11] M. T. Dangyan, *Chemical Abstracts*, 1946, *40*, 3398.

The Chemist And The Paint Factory

Importance of Understanding the Business Side

CHEMISTS in industry must be something more than chemists, and must be concerned in many other matters besides scientific and technological subjects.

"A Few Aspects of Accounting and Costing in a Paint Factory," was the subject of an address given by Major Denis Thatcher, managing director of the Atlas Preservative Co., Ltd., to the London Section of the Oil and Colour Chemists' Association on 17 January.

Major Thatcher directed his remarks primarily to the chemists, works managers and other factory executives and management assistants, and confined himself to some of the accountancy and costing problems in the factory and in the manufacture of paint as distinct from the costs of selling paint.

"Costing," he said, was not another word for estimating. It was the process by which the historical charges applicable to production were broken down in order to arrive at the cost of an individual production batch, or an individual class of product or groups of products.

The cost of a gallon of paint filled into a container was made up of (1) raw material, (2) container, (3) direct labour and (4) factory overheads. The total of those four items was the factory filled cost; and the difference between that cost and the net selling price was the gross profit.

Gross profit was the first main control figure in any manufacturing organisation; the gross profit margin was the figure which works managers and, in his opinion, their assistants and chief chemists, must watch and, so far as lay in their power, control.

The percentage of gross profit would vary from period to period and from department to department, and works managers and chief chemists who were doing their job would want to know why.

Raw Material Problems

Raw material was the largest individual item of cost, and one which was steadily going higher. Running side by side with the method of ascertaining raw material costs of products were the methods of raw material stock control; the total value of raw material stock pile represented a high proportion of the assets of any paint company. Raw material control was of immense and increasing importance.

A stock control system enabled us to control the day-to-day capital investment in raw material. Chemists had a happy habit of changing formulations; as a result, certain raw materials fell into partial disuse and became "stuck," so that liquid money was locked up, doing nothing.

This would be revealed by a good stock control system, and the chief chemist might be persuaded to use that stock; otherwise it must be disposed of. Again, in normal conditions, when raw material was available, the stock control would determine re-ordering levels so that there was sufficient to meet production needs without locking up excess cash.

Check on Stock

Emphasising that stock records did not help to reduce losses unless a continual check were kept on the physical balances against the record balances, he urged that every material should be checked at least four times a year; the more expensive items, and those particularly subject to handling losses, should be checked much more frequently. Having determined the losses by such checks, steps could be taken to reduce them.

Factory expenses and factory administration must be broken down into the various manufacturing departments in the factory—paint shops, varnish shops, cellulose department, and the like. In some compact works that was simple; in others it could be difficult, and in those the departmentalising of expenses must of necessity be an approximation, albeit, with experience, an informed approximation.

In conclusion, Major Thatcher remarked, You don't have to be a master mind to produce figures; it is the man who can read them right who is worth his pay. And on a lighter note he recited a parody he had written on that much over-parodied poem from Rudyard Kipling's "Rewards and Fairies"—

If you know INDIRECT from DIRECT wages,
And from your records handling losses tell,
If you can allocate expenses by stages,
And thus recover overheads as well,
If you can cost each manufacturing minute
With all the work that men and plant have done,
Then industry is yours and all that's in it,
And, which is more, you've done a job, my son.

In the discussion which followed, Mr. R. W. Wilkinson asked if Major Thatcher would agree that it would be better to recover losses of stores and volatile losses on raw materials as a percentage on each raw material, rather than create a storage loss account. The loss of stores might be 1 per cent, whereas the loss of volatile liquids might be 10 per cent. He also queried how the costs of the raw materials used for tinting were best recovered; their quantities were sometimes too small to measure by batch.

Would the author agree that there should be in the paint industry some unit of productivity measurement? We referred to output in terms of hundredweights and gallons; but when manufacturing products we used some totally different materials. He wondered whether some system of numbers could be adopted by the industry.

Direct Method Best

Major Thatcher, agreeing with Mr. Wilkinson's first point, said he had referred in the paper to applying a varying loss percentage to the varying types of raw material shown on the batch sheet and crediting a stores loss provision or suspense account. In general, he considered that to be the best method. But it did involve a lot of calculation; if there were 10 materials on a batch sheet there were perhaps 10 separate calculations to make. The great point was to produce the information as quickly as possible; but on the whole he thought that the direct method was the best.

The simplest way to deal with raw materials for tinting was to charge a tint as used in bulk as an indirect raw material to the appropriate department. The labour time was direct labour on that job. If the practice were to record all direct labour by batch, that charge was included; if direct labour were recorded on groups of products or as departmental direct labour, the charge was included there.

Beyond the Wit of Man

The point concerning a unit of productivity measurement had his general approval, but how that was to be arrived at he did not know. There were three trade associations in the industry; but it seemed to him that to arrive at agreement on measuring productivity in one unit was beyond the wit of man at the moment.

Mr. H. A. Newnham asked if the author differentiated, in the method of charging laboratory salaries and expenses, according to whether members of the laboratory staff were working in the control laboratory, as opposed to the research laboratory. Arising out of that, he had gathered that the laboratory expenses, in a general sense, would be a charge to the manufacturing department concerned; but research expenses, if charged to a product just launched or about to be launched, might kill the item immediately.

Research expenses, replied the author, needed to be whipped out of the statement of manufacturing costs and sales. One would not wish to have research muddled up with the manufacturing gross profits, and he would drop in that cost well below the gross profit line; it was not administration.

Dr. Stoyle spoke of introducing some inducement, perhaps by way of a bonus, to encourage workpeople to avoid losses of raw materials. The losses of valuable raw materials, such as Monastral Blue, for example, could be very considerable, and perhaps a proportion of the saving effected in any period could be allocated to the workpeople. It might be difficult to work out, but even a token payment had had quite a considerable effect and the workmen had been known to speak to each other about avoiding losses.

Saving Waste

If incentive or bonus schemes were applied, it was only fair, said Major Thatcher, that a proportion of the saving due to avoiding wastage should be credited to the sum distributed to the workpeople. But he was not sure that bonus schemes in the paint industry were very workable.

A scheme used at his works involved marking the containers of valuable raw materials with gold stars. If a material had a value something like that of gold dust—such as silicones—the container would bear three stars, and if a material were within a lower range of value its container would bear two stars, the containers of materials of still lower value bearing one star. The arrangement seemed to work. Raw material losses represented an immense charge in the industry.

Effects of Metal Shortages

The discharge of some 250 workers in its metals division was announced recently by I.C.I. as a result of reduced supplies of Canadian copper and zinc. This was the first large Midland employer in the non-ferrous industry to make known the effects of restrictions and shortages on output and employers.

Comparison of CO_2 Recorders

VARIOUS instruments have been installed in a large number of boiler houses to assist in improving the efficiency of combustion, but many of them are not maintained in good working order. Even the most important instrument for combustion control—the CO_2 recorder—is often out of action, especially in smaller plants, and the efficiency of the plant is thereby diminished and fuel consumption increased.

At the request of the Ministry of Fuel and Power, arrangements were recently made to test various types of commercial CO_2 recorders at the Fuel Research Station, under industrial conditions. It was hoped that the tests would indicate to what extent the trouble was due to some inherent fault in the instruments, and that they would supply information of value in assessing the type of instruments most suitable for a given installation. These tests and the results obtained have been fully described in a paper by L. J. Flaws, W. Hill and W. J. Sparkes.

Six representative recorders were obtained and, after a preliminary run, were kept in continuous operation on gas drawn from the flue of a hand-fired Lancashire boiler over a period of six months. Daily observations were made of the time required for maintenance, and special tests were carried out to find the accuracy of each instrument and the length of time taken by it to respond to known changes in the CO_2 content of the flue gases.

During the tests the various instruments were given no more skilled attention than could be made available in most small works and, as far as possible, they were operated and adjusted according to the makers' instructions. Except in one case, no major modification was made to the mechanism, and no adjustments were made unless the error to be corrected was 0.25 per cent, or more.

Effected by Fuel Variations

Some types of CO_2 recorders are known to be affected by variations in fuel composition and by the presence of even very small quantities of hydrogen in the flue gas, but no attempt was made to examine these effects. Fortunately, the boiler was operating most of the time on coke of fairly constant quality, with which it was easily possible to maintain simple combustion.

The tests and the maintenance of the recorders was carried out by a junior engineer (Assistant Experimental Officer grade), who had no previous experience of boiler-house instruments.

The recorders tested were selected as examples of various commercial types. Some of them were new, but others had already been in use at the station and were reconditioned for the tests. Three of the instruments operated by chemical absorption, one by diffusion, one by thermal conductivity, and one by density.

For the purpose of the tests the six recorders were mounted side by side on a suitable framework. Each instrument was connected by a short pipe to a " bus " pipe through which flowed a stream of flue gas drawn from the side flue of a hand-fired natural-draught Lancashire boiler. The boiler was fired mainly with coke and the flue-gas sample was cleaned in a filter using graded coke followed by gas wool.

Reducing the Time Lag

To reduce time lag the quantity of flue gas drawn through the pipe line was several times that required by the instruments, and the dimensions were such that the time taken to travel through the 9 ft. bus line was 13 seconds. A flow meter fitted near the end of the line enabled a constant velocity to be maintained and a number of U-gauges suitably disposed along the line were used to indicate either leaks or increased resistance. When required, the bus line was supplied with gas of constant composition from a small gas holder which could be filled with flue gas drawn from the Lancashire boiler flue. The percentage of CO_2 was varied by introducing some air into the holder and provision was made for circulating the gas and air mixture to ensure uniformity of composition.

For most of the 24 hours of the day all the instruments recorded the composition of the gas in the boiler flue, but for test purposes a different routine was followed. The bus line was disconnected from the flue, and left open to the atmosphere. When all the instruments were running on air, the zero reading of each was noted and, when required, adjustments were made until all the recorders read correctly at zero CO_2. At the same time the recorders were prepared for the next 24 hours' operation.

The accuracy of the instruments was checked by feeding the bus line with gas of constant quality from the holder, which had previously been filled with flue gas, the CO_2 content of which was varied from test to test as desired. The " correct " percentage of CO_2 in the flue gas was

determined by means of the Orsat apparatus, two of which were used—one at each end of the bus line—in order to indicate leaks. Actually, no differences in reading were obtained at any time during the tests.

While the change over from air to flue gas was taking place, frequent readings were taken from the recorders to find the time taken for each to record within 1.0 per cent of the maximum reading, and the time taken to record the maximum reading.

After about half-an-hour, when the gas holder was nearly emptied, the pipe line was disconnected from the holder and left open to the atmosphere. The time was observed for the instruments to record zero CO_2 and to record within 1.0 per cent of zero. The zero reading of all the instruments was then checked and the bus pipe line was re-connected to the side flue of the boiler.

Considerable Trouble Experienced

During the preliminary running considerable trouble was experienced with filtration and with deposits which occurred in the pipe line long before the flue gas reached the instruments.

The difficulty with filtration was to deal efficiently with the relatively large volume of gas required for six recorders without undue time lag and without allowing a high pressure drop to build up in the filter. The coke and glass-wool filter finally adopted probably let through more fine dust than those normally used with some of the recorders, and blockages took place at intervals of about two to four weeks. In five of the instruments they occurred near the inlet, and could be easily observed, and removed in a few minutes. In the case of the sixth recorder it was necessary to clean the impellers about once in every three weeks, the time taken being about 25 minutes.

The deposits in the pipe line were mainly the result of condensation taking place as the flue gases cooled down, and they occurred in the vertical pipe leading from the flue to the filter and in the pipework immediately before the filter. They were finally prevented by lagging the vertical pipe and by modifying the drainage system.

The amount of attention given to these points was greater than would be given in many small plants where no special effort would be made to keep CO_2 recorders running. Without it the instruments would either have stopped running or have behaved unsatisfactorily. It is therefore most desirable that when a CO_2 recorder is installed, either the makers, or some other competent authority, should supervise the erection of the pipe work and inspect it later in operation. The instruments themselves gave every indication that, with the amount of attention given them during the tests, they could have continued running equally well more or less indefinitely.

Each day during the tests the "gross" and the "net" time taken to keep each recorder in running order were noted. The "net" time was that taken to carry out normal routine operations such as changing the charts, checking and, if necessary, resetting the zero readings, and inking the pens. The "gross" time included, in addition, the times taken for the instrument to reach zero and respond to any adjustments when these were necessary. The zero reading of each instrument was checked daily throughout the tests.

Over a period of six months each of the instruments showed that, within specified limits, it is capable of giving continuous and reliable service in the field of application for which it is suitable. One that operated by changes in specific gravity requires further mechanical development, this is being done by the makers.

The "net daily servicing time" is not large for any of the instruments, being in all cases well under 10 minutes. If the zero is checked daily and the time to reach zero is included, this places the diffusion type at a severe disadvantage owing to its considerable time lag (the time taken to record within 1 per cent. of the correct percentage of CO_2 was 8 minutes, but the time taken to record the correct value was from 12 to 22 minutes).

Zero Setting Varies Less

On the other hand, the zero setting of this instrument varies less from day to day than that of any other type, so that it may not need frequent adjustment. The time lag of the chemical type, although smaller than that of the diffusion type, is also serious and neither of these types will respond quickly or effectively to rapid fluctuations in gas composition. In this respect the (electrical) thermal conductivity type is outstanding, although a good response is also obtained with the gravity type.

Should only a moderate degree of accuracy be required, then with reasonable daily servicing all types are capable of a good, reliable performance.

Whatever type of CO_2 recorder is user, care should be taken to avoid the deposition of dust or scale in the pipework between the boiler flue and the instrument.

Dry Rot in Timber

Causes and Some Chemical Treatments

IN a paper read to the Royal Society of Arts in London on 24 January, Mr. W. P. K. Findlay described the causes of decay in timber and outlined methods for the prevention and cure of dry rot.

Mr. Findlay, who is Officer-in-Charge of the Mycology Section, Forest Products Research Laboratory, DSIR, first dealt with the historical aspect of the subject and drew attention to the fact that the Royal Society of Arts was the first body in Great Britain to encourage the study of dry rot in timber. He then proceeded to discuss the causes of decay in wood and how dry rot fungus may be recognised.

Speaking of the conditions for the development of dry rot and of its treatment and eradication, Mr. Findlay gave a description of the chemical nature of the processes involved and the procedures to be adopted, the substance of which is as follows:—

Like other plants, fungi require moisture for their growth and their spores are unable to germinate so long as they are kept dry. Wood containing less than 20 per cent moisture content (based on the oven dry weight) is immune from attack, and in practice there is little risk of wood being attacked if it contains less than 25 per cent moisture. Persistent dampness is necessary for an outbreak of rot to become established—rot often starts in a fence at the point where the rails come in contact with the posts, where moisture rests, and not in the exposed parts which are wetted as often, but which can dry out quickly.

Can Synthesise Water

When once established the dry rot fungus is able to synthesise water by its action on the wood substance. By means of its enzymes or ferments it breaks down the cellulose into glucose sugar which it absorbs for its nourishment giving off carbon dioxide and water according to the equation.

$$C_6H_{12}O_6 + 13O = 6H_2O + 6CO_2.$$

So a vicious circle is established—the more wood is decayed, the moister it becomes. It has been suggested that the habit of perspiring tears of moisture has a two-fold purpose (1) to render the ambient air moist and thereby to moisten wood ahead of the advancing mycelium; (2) to remove some of the water produced by the activities of the fungus.

Wood-rotting fungi are aerobic organisms, they require air for their growth and metabolism. Wood which is waterlogged and submerged under water does not decay—one of the best ways of storing logs that are waiting to be sawn up is to submerge them under water.

Fungi vary in the amounts of moisture and air which they require. *Merulius* thrives in a moderately damp wood, and if the moisture content is over a certain figure other species, such as *Coniophora cerebella*, will be found taking its place.

Stimulated by Warmth

The growth of fungi is stimulated by warmth, and up to a certain point the warmer it is the faster they grow. Below freezing point all growth ceases, though fungi in wood are not killed by temperatures far below zero. The growth of most fungi is about twice as fast at 70° as at 50°F.—that is one reason why timber can decay so rapidly in damp mines, where the temperature may reach 80°.

Light tends to check the growth of fungi and often stimulates them to fructify. Ultraviolet radiation has a killing action on micro-organisms, but they are extremely resistant to X-rays. Cultures of *Merulius lacrymans* were exposed to doses of X-rays sufficient to kill a man, and remained apparently undamaged.

Having found that there is decay in some part of the woodwork of a house the first step is to find out what has caused the decay and how conditions arose which made it possible for it to develop. Unfornately the presence of rot is often not discovered until it has become fairly widespread, but signs of persistent dampness should arouse one's suspicions.

Wood-boring insects such as the furniture beetle and the death-watch beetle can also cause extensive damage to woodwork, and it is important to distinguish between the damage which they cause and the results of fungal decay because the treatment required is different. The presence of wood-borers can be readily recognised for these insects tunnel out galleries in the wood which usually contain a powder, and make little round exit holes on the surface of the wood through which the mature beetles emerge after pupating. It is not

uncommon to find both types of damage in the same piece of wood, for some insects, such as the death-watch beetle, prefer to attack wood that has already been softened by decay.

If the wood is found to be decayed, the next thing is to decide whether the fungus responsible is indeed the dry rot fungus, *Merulius lacrymans*, or some less virulent species. If *Merulius* be found then a most careful survey should be made to find out just how far it has spread. Dry rot is almost always found to be more extensive than it appears at first sight, for it is an insidious plant and creeps along distances behind plaster and through masonry to reach woodwork at some distance from its starting point. All decayed wood should then be cut out and burnt on the site—wood affected with dry rot should never be sold to a firewood merchant who may thereby distribute the infected material to many other houses.

Should Be Removed

If only the end of a joist is affected the decayed portion should be cut off with a margin of a foot or so behind the last visible signs of attack, as the infection may have spread internally further than the outward visible signs indicate. It is particularly important to get out any timber embedded in the walls, such as fixing plugs, which can act as reservoirs of infection. In many of the older brick buildings, bonding timbers were laid deep in the walls—these often give rise to trouble and their removal may prove both difficult and costly, but it is essential they should be removed if they have become infected with dry rot.

Brickwork or stonework which has been in contact with timber infected with dry rot is usually found to be infected with fungal strands and it must be thoroughly sterilised before new timber is brought in. It is a difficult matter to sterilise walls into which the strands have penetrated deeply and in extreme cases it may be desirable to pull down old stonework and build it anew—but provided the source of dampness can be removed it is usually possible to sterilise the brickwork to a sufficient depth to prevent re-growth of the fungus.

This is done by heating the wall with a powerful blow-lamp flame until it is too hot to touch and then drenching it with an antiseptic solution such as copper sulphate (3 oz. to the gallon), sodium fluoride (6 oz. to the gallon), or sodium pentachlorphenate (8 oz. to the gallon). If the wall is thick and the fungus penetrated deeply it is a good idea to impregnate the brickwork by allowing the solution to drip into the wall through holes drilled in it at the upper limit of the infected area. If excessive amounts of solution are poured into a wall in this way the soluble salts may crystallise out on the surface of the brickwork and spoil subsequent decorations.

Merulius lacrymans is killed quite easily by heat and if the temperature of the whole wall could be raised above 120°F. for an hour or two sterilisation would be complete. Attempts have been made to do this by hanging electric hot-plates on the wall until it is heated throughout (Habberstad process) but this method is slow and tedious. There is the attractive possibility of rapid sterilisation by dielectric heating, but the apparatus so far developed is not readily portable.

If possible, walls should be left exposed at least for a few weeks after treatment so that any further outgrowths of fungus can be observed and dealt with before new woodwork is reinstated.

It is essential that all the new timber used for repairs should be thoroughly treated with an effective wood preservative *before* it is placed in position. If the walls are permeated with fungus or if there is a risk of dampness persisting owing to absence of a damp-proof course, etc., it is advisable to have the timber impregnated under pressure with preservative, a treatment which can render it permanently immune from the attack of fungi and insects. If, however, it can be assured that the building will dry out and stay dry, the preservative can be applied by brushing on.

There are three main types of wood preservative:—

1. Creosote preservative, derived by distillation of coal tar.
2. Water-soluble preservatives such as sodium fluoride.
3. Solvent type preservatives consisting of a material toxic to fungi, such as pentachlorphenol dissolved in a light oil.

There are a number of effective proprietary products in each class and some of these are designed to meet special purposes.

Odour Important

In some situations, such as a food store or shop, the absence of odour may be important and a water-soluble product would then be recommended. If it is desired to paint over the treated wood, the use of creosote should be avoided and a water or solvent soluble preservative should be used.

Coal Shortage Hits Germany

THE retrograde tendency of German chemical production noted before the end of 1950 continued in the first few weeks of the new year owing to the increasing shortage of coal. South German manufacturers who used to rely on coal and lignite from Central Germany have been hit severely by lack of fuel, and production in the Rhineland has also been affected. At the Knapsack works of AG für Stickstoffdünger, near Cologne, a ferro-silicon furnace and a carbide furnace had to be closed down because of electricity supply difficulties.

Dow Corning silicones are now supplied to German consumers in the form of fluids, compounds, greases, resins and Silastic by Dr. Alexander Wacker GmbH, Munich. This company announces that some of these silicones will shortly be made in Germany. New vitamin preparations are being offered by E. Merck, Darmstadt, including Cytobion, described as pure crystallised vitamin B_{12} with 4.5 per cent of cobalt as well as phosphorus and nitrogen, but free of sulphur; Hexobion, vitamin B_6 with the chemical formula 2-methyl-3-oxy-4,5-di-(oxymethyl)-pyridine; and Polybion, which is a compound containing vitamins B_1, B_2 and B_6.

Riedel-de Haan AG, Seelze, has put a new remedy for venous diseases on the market. It is called Venogal and is made from horse chestnuts. This firm is also making a new range of phosphorescent substances for which it is claimed that they will remain luminous much longer than the materials available hitherto.

Trade negotiations with various European countries remain inconclusive. The commercial talks with Holland have been held up by Germany's refusal to accept the large quantities of vegetables and fruit Holland wishes to sell in return for German manufactures, while exports of German goods, including chemicals, to Italy, are made difficult by the high Italian import duties.

Substantial Increases Planned

The talks with Sweden, on the other hand, have resulted in a new trade agreement which provides for a substantial increase in shipments in both directions this year. Western Germany is to export chemicals to the amount of $20 million to Sweden, compared with $9 million in 1950, including dyestuffs to the value of $1.6 million, against $50,000 in the second half of 1950.

Sales figures for the three large successor companies of I. G. Farbenindustrie, which are not normally published, are mentioned in a memorandum by Professor Dr. H. Gross, of Kiel, in support of the German plea against further splitting up of the I. G. Farben successors. During January-September, 1950, the sales of Farbenfabriken Bayer, Leverkusen, were at an annual rate of $122.8 million, those of Badische Anilin- und Sodafabrik, Ludwigshafen, at $107.9 million, and Farbwerke Hoechst, including Griesheim, Naphtol-Chemie, Behring and Knapsack, at $95.6 million. Early in 1950, the three chemical groups mentioned employed 25,500, 23,000 and 15,700 persons respectively.

Potash Mining Resumed

Potash mining has been resumed by Burbach-Kaliwerke AG in the Königshall-Hindenburg pit at Rheyershaysen, near Brunswick. Regular mining operations, however, will not be undertaken here before the end of April, and the new potassium chloride works are to be put into operation a year later. Great hopes are entertained for the Königshall mine because of the discovery during the rehabilitation work of a new potash deposit, containing mineral with a K_2O content of over 20 per cent. When in full operation, the new mine will supply 3000 tons of potash salts a day. The total capital expenditure is expected to reach DM.16.5 million.

Despite warnings from industrial quarters that raw material shortages threaten to interfere with manufacturing operations, especially in the case of non-ferrous metals, the Federal Government has hitherto refrained from imposing restrictions on consumption or sales but merely recommended that non-ferrous metals should not be used for superfluous purposes such as roofing, cold water pipes, interior decoration, ash trays, light fittings, etc. A raw material committee has now been formed by the Federal Government to watch the use of scarce raw materials and to suggest suitable measures to represent German interests abroad. A ban on the use of critical raw materials *may* be put into effect when legislation now in preparation has been passed, but no date has been given yet for the enactment of such legislation.

Atmospheric Helium

ATTEMPTS to prove the presence of tritium (H_3) in the atmosphere have recently been made by Dr. Paul Harteck and Dr. V. Faltings, of the Hamburg University Institute of Physical Chemistry. Writing on the subject to *Nature* (1950, *166*, 4235) the investigators say that free atmospheric hydrogen, found in air in a concentration of 5×10^{-7}, was burned with copper oxide out of the helium-neon fraction of an air-liquefaction plant.

Enriched 20 Times

The water was electrolysed down to one-fortieth of its volume in order to enrich the tritium twenty times. The tritium-containing hydrogen of the enriched water was used to make ethane, the activity of which could easily be examined.

According to their measurements, about one mole of elementary tritium is present in the whole dry atmosphere of the earth, or one atom of tritium in 10 cm.^{3} of air. It is evident that this tritium has been produced by nuclear fission in the upper layers of the atmosphere, and did not take part in the atmospheric water circulation, but has remained elementary hydrogen.

The amount of herium-3 found in the earth's atmosphere can be compared with that produced in the course of the earth's history by tritium, which has a half-life of 12 years, breaking down to helium-3.

For this purpose it is necessary to have a precise total balance for the tritium. The amount of tritium in the free hydrogen of dry air has been determined but, say the authors, it is to be expected that a much higher amount of tritium will take part in the water circulation of the atmosphere. This amount can be estimated from kinetic relations and the distribution of the cosmic radiation intensity; on the other hand, recent U.S. measurements give the concentration of tritium in rain water as 10^{-8}. This means that there is an enrichment of about 10,000 in atmospheric hydrogen compared with rain water.

If the intensity of the mosmis radiation has always been the same as now, and taking 3.6×10^9 years for the age of the earth, there should be 2×10^7 atoms of helium-3 in 1 cm.^{3} of air under normal conditions, provided that only the tritium in the free hydrogen of the dry atmosphere is taken into account. There are, in fact, 1.5×10^5 atoms of helium-3 in 1 cm.^{3} of air and it is obvious that this estimated concentration of helium-3 is only one-eighth of that actually found.

The cosmic radiation may, however, have initially produced as much helium-3 as tritium. Much of the tritium has certainly come into the water circulation. With an assumed mean annual rainfall of 18 cm., averaged over the whole earth, and a concentration of tritium of 10^{-18}, as measured by Libby and Grosse in the U.S., the estimated figure for the concentration of herium-3 should rise to about 5×10^9 atoms/cm.^{3}. In this case most of the helium-3 must have left the earth.

By measuring the concentration of tritium in several samples of C_2D_6 prepared from heavy water, the authors hope to get a fairly accurate value for the tritium content of the whole earth. This would form the necessary base for discussing the loss of helium-3 from the atmosphere.

Atomic Energy in Canada

CONSTRUCTION of another atomic energy pile at Chalk river has been authorised by the Canadian Government and the Atomic Energy Control Board have been instructed to proceed with the plans.

The new pile, announced by Mr. Howe, the Minister of Trade and Commerce, will be much larger and more powerful than the present reactor. Parliament will be asked to provide $30 million to meet the cost.

Canada's position as a leading country in the development of all aspects of the peaceful application of atomic energy will be assured by the improvements incorporated in the design of the proposed pile. It will also provide the Dominion with an adequate supply of plutonium, besides providing fresh opportunities for nuclear studies and increased facilities for the industrial application of radioactive minerals.

Since the reactor at Chalk river was put into operation it has been argued that any new reactor should be of the heavy-water moderated type. Its high flux density would provide means for further scientific research and enable more radioisotopes to be produced.

Thermal Activation of Bauxite

ACTIVATED bauxite, at first used mainly in refining petroleum, has in recent years found wider and more diverse applications.

The changes effected by thermal treatment on Italian bauxites have lately been the subject of study by Riccardo Sersale, Industrial Chemical Institute, University of Naples, who has also reviewed some of the extensive literature on the subject. (*La Ricerca Scientifica*. 1950, *20* (11), pp. 1685-1698.)

Mineralogical differences between American and European bauxite are considered. The former consist mainly of the gibbsite and hydragillite varieties or the trihydrate (of alumina) while in the latter, monohydrate forms such as diaspore or boehmite predominate.

The Main Difference

Hydration is therefore the main difference with the consequent varying effects on heating. Monohydrates, for example, require a temperature of at least 450°C. for dehydration—boehmite indeed much more—while to start the initial stages of dehydration the trihydrates only need heating to 240-280°C.

American bauxites at a temperature above 200°C. approximate the boehmite form, and at about 450° transform into alpha-alumina. But recent methods of differential thermal analysis indicate that the process is somewhat more complex. At least three stages in water elimination are included: the first at 200-250°, the second at 250-300°, and the third at 450-480°C.

Comparisons of the thermal behaviour of the natural form hydragillite and the synthetic bayerite have raised further questions in respect to crystalline structure, and also as to the degree of dehydration needed for maximum activation, on which American workers—H. C. Stumpf, A. S. Russell and others—have recently reported (*Ind. Eng. Chem.*, 1950. *42*, 1332, 1398).

A detailed study including X-ray examination of the varieties diaspore (alpha) and boehmite (gamma) has also been made by Staesche and Wetzel who confirmed that, as a result of water elimination, diaspore yields exclusively α Al_2O_3 and boehmite γ Al_2O_3 (*Metall. u. Erz*, 1944, *41*, 101). The decomposition of boehmite started at about 450° and was completed at 600°; further transformation of γ—α of the oxide began at 900° and finished about 1150°. They also found that most of the iron present in red bauxite is alpha iron oxide (Fe_2O_3); and that the presence of impurities or inclusions in the alumina lattice structure—as would be expected—involve appreciable differences in the effects of thermal treatment.

Sersale himself has investigated some Italian bauxites from the Cusano Mutri district and other places. Possibly the best known are those of Sannio. Most of these, however, have not yet attained any high commercial importance, although the author thinks that further attempts should be made in view of the wide and varied possibilities of bauxite as raw material for refractories, abrasives, cement, refining agents and so on.

Samples of clear bauxite from Cusano Mutri and of red bauxite from Dragoni were analysed. Some results are also described and graphed of thermo-differential, thermo - gravimetric and thermo-dilatometric analysis, as well as X-ray spectra.

The general conclusion was that the two Italian types, clear and red, were both of the boehmite variety, and differed mainly in their content of iron oxide which, chiefly as hematite, was present in large amount in the red Dragoni type.

Dehydration was found to take place largely round 480°. The resulting oxide was the gamma form which only at a temperature above 900° changed into the alpha form of Al_2O_3. Dehydration was accompanied by vigorous and substantial swelling with consequent high porosity, increase in specific area and adsorbent power.

British Council's Courses

INSECTICIDES AND WEEDKILLERS will be the subject of a British Council course for specialists from overseas to be held at Rothamsted and Oxford from 18 June to 3 July.

The first week of the course will be taken by Dr. C. Potter at the Rothamsted Experimental Station, and the second by Professor G. E. Blackman at Oxford. Visits will be made to Pestrol Control, Ltd., Plant Protection, Ltd., and Shell Chemicals, Ltd.

Other courses will include: Water Pollution (London and Birmingham, 21 May to 2 June) and Cartography (London, 16-30 May).

The scope of the programme for overseas visitors has this year been extended to include a series of special courses related to the Festival of Britain.

PERSONAL

LORD KNOLLYS has been appointed to serve as the United Kingdom representative on the raw materials central group to be set up in Washington by the Governments of the U.K., U.S.A., and France to deal with problems of world shortages. Lord Knollys is managing director of the Employers' Liability Assurance Corporation and a director of the Merchant Marine Insurance Co., and of Barclays Bank.

DR. D. A. W. ADAMS, B.Sc., Ph.D., who is very well known in the dyestuff intermediates industry, recently joined the staff of Hickson & Welch, Ltd., Castleford, Yorks., as technical manager. Dr. Adams graduated from Leeds University with first-class honours in colour chemistry in 1934, and was awarded his Ph.D. in 1936. He joined the Huddersfield branch of I.C.I.'s Dyestuffs Division the same year, and since 1943 has been in charge of development research on intermediates, fast bases and brenthols. He was a member of a BIOS team which visited Germany immediately after the war.

Dr. Adams

The directors of Charles Tennant & Co., Ltd., Glenconner Works, Hillington, Glasgow, announce that MR. J. SEFTON has been appointed general manager as from 1 January, 1951. Mr. Sefton joined the staff of Charles Tennant & Co., Ltd., at the Belfast branch twenty-five years ago.

The death has occurred in Dublin of MR. STEPHEN CULLINAN, an authority on soils and artificial fertilisers. Mr. Cullinan was agricultural adviser for Ireland to the United Potash Company.

MR. WILLIAM NEILL, former managing director of the Cassel Cyanide Co., Ltd., died at his home in Glasgow on 12 January at the age of 77. He began his career as a junior with the firm in Glasgow working at Ruchill. When the firm was taken over in 1927 by Imperial Chemical Industries, Ltd., and transferred to Billingham, he became delegate director until his retirement.

Applications of Stoneware

ONE of the factors which facilitated the phenomenal expansion of the chemical and allied industries during the 19th century was the availability of a thoroughly reliable acid-proof plant material in the form of salt-glazed chemical stoneware. The industrial development of this material was largely due to the pioneer work of John Doulton (1793-1873) and his son, Sir Henry Doulton (1820-1897).

It is a significant fact that, despite the introduction of so many entirely new chemical plant materials in recent decades, acid-proof stoneware is to-day probably in greater demand than ever before from those industries in which corrosion is one of the major problems to be overcome.

Some modern applications will be exhibited by Doulton and Co., Ltd., in Birmingham, at this year's British Industries Fair.

The central feature of the display will be three different types of tower. One will be an absorption tower in white chemical stoneware. Another will be a plate column tower shown in Acitherm. This heat and thermal-shock resisting material is finding many applications in water-white hydrochloric acid plant, reactions in the plastics and petro-chemical industries and nuclear fission. The third is a bubble tower also in white chemical stoneware.

Other types of plant which will be on view include 60-gallon gas absorption vessel in Acitherm; a centrifugal pump impellor and other parts, as used in the Doulton-Pulsometer pump; acid jugs; and a series of ground butt-jointed pipes in white chemical stoneware.

In London, at Olympia, Royal Doulton laboratory porcelain will be displayed. In addition to the generally known articles such as evaporating basins and crucibles, there will be porcelain bunsen burners, ball-mills, mortars and pestles.

Oil for Egg Preservation

A method of improving egg preservation by oil dipping designed to maintain the general quality of shell eggs is now being applied in this country. Tests carried out with a special grade of oil supplied by Shell have shown that the treatment with oil of new laid eggs before cold storage maintains their taste and quality for as long as seven months. When an egg is thus treated the pores of the shell are filled with oil, loss of moisture and carbon dioxide is lessened and it becomes difficult for microbes to invade the interior.

Technical Publications

THREE new booklets in the Raw Material Survey Series have just been published by the Purchasing Officers' Association. No. 4 deals with coal and outlines the history, development and output of the main coal areas, briefly describing refining processes and coal utilisation. No. 5 is devoted to non-ferrous metals and discusses the principal metals and alloys. No. 6 in the series is a short symposium on manufactured abrasives and industrial diamonds.

* *

AUDLEY ENGINEERING COMPANY have recently issued their up-to-date catalogue of Audco lubricated valves. The new edition contains a complete description of each valve, together with photographs, charts, comprehensive diagrams and specification, etc. Free copies are available on application to Audley Engineering Co., Ltd., Newport, Shropshire.

* *

MECHANICAL handling equipment is described in the latest booklet published by Richard Sutcliffe, Ltd. The booklet contains an illustrated account of the development and uses of gate and trunk conveyor components, and indicates methods of improving conveying efficiency.

* *

ALKYLATION processes and their developments and a description of two new units built for the production of a high octane blending component for automotive petrol are contained in "The Kellogg-gram" (No. 5, 1950) recently published by the M. W. Kellogg Co., Jersey City, N.J.

* *

DETERGENTS, their properties, characteristics, and wide range of applications are simply described and illustrated in "A Cleaner Outlook," a new brochure issued by Shell Chemicals, Ltd.

* *

KNOWLEDGE of the molecular weight of lignosulphonic acids and their variation during the cooking process is of interest in studies on the chemistry of cellulose cooking. Results of an investigation into the eventual break-down of molecular weight during sulphonation are described in an article in *Svensk Papperstidning* (Swedish Paper Journal, Vol. 54, No. 1).

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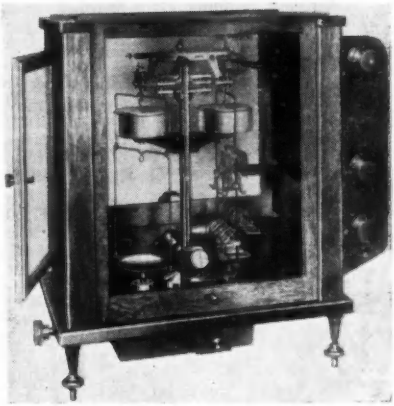

A New Model Stanton Balance

STANTON Instruments, Ltd., have announced that certain improvements have been effected in their aperiodic balances. They are as follows: 1, A mercury switch is now fitted which operates the light as the beam is released. For those who prefer permanent illumination the switch can easily be disconnected; hence its use is optional. 2, Agate bearing points are now fitted to the arrester mechanism. This gives smoother operation and obviates sticking caused by corroding points. 3, Green filters are now incorporated in all projection reading balances. This is to reduce further the transfer of heat to essential parts of the instrument and to give a clearer image on the screen. The new re-designed models, B.A.5, B.A.6, and B.A.7, will include all of these improvements. In addition, the weight loading device has been altered so as to provide perfectly smooth application and finger-tip control, even for the heaviest weights. The new balances are said to be ideal for industrial control work where speed is essential, even where semi-skilled operators are employed.

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PROGRESS made in the steel industry during the past five years is reviewed in the *Monthly Statistical Bulletin* (Vol. 25, No. 12) published by the British Iron and Steel Federation.

HOME

Ground Sulphur Price Increase

The Board of Trade have made an Order, coming into effect on 29 January, permitting an increase of £3 1s. 6d. per ton on maximum prices of all grades of ground sulphur. This increase is due to increases in the world price of crude sulphur and the rise in freight rates. Copies of the Order, the Ground Sulphur (Prices) (Amendment No. 4) Order, 1951 (S.I. 1951, No. 85), can be obtained, price 2d., from the sales offices of H.M. Stationery Office.

Smoke Abatement Report

The report of the 17th Annual Conference of the National Smoke Abatement Society, which was held in September last year, has just been published in book form. In it are reproduced all of the papers read at the conference, including the Des Voeux Memorial Lecture "Towards the Better Use of Coal," by Dr. D. T. A. Townend. The title of the book is "Proceedings of the Margate Conference, 1950," and it is published by the National Smoke Abatement Society.

Naphthalene Fire at Bradford

Premises used by the Bowling Firegrid Company at Foundry Lane, Bradford, for the manufacture of firelighters, were badly damaged when a hundredweight of boiling naphthalene caught fire on 19 January. The naphthalene spilled out from a cracked boiler and the fire spread to more naphthalene and some wood shavings. The fire brigade extinguished the blaze after about forty-five minutes.

New Aluminium Trade Council

The newly-formed Aluminium Industry Trade Council has set up offices at 60 Calthorpe Road, Edgbaston, Birmingham. The objects of the council are to provide liaison between all branches of the aluminium industry on matters of general policy which affect the industry as a whole and to represent the British aluminium industry in negotiations with Government Departments, trade organisations and other bodies. The first chairman of the council is Mr. Kenneth Hall, managing director of Northern Aluminium Co., Ltd.; the first director is Mr. H. R. Murray Shaw. The council will not encroach upon the work of the Aluminium Development Association, which will continue to further the interests of the industry in the field of applications and uses.

Tin Prices Firmer

After a small increase on 18 January, prices of tin on the London Metal Exchange were irregular, but became steadier on 22 January. At the closing session, spot metal was sold at £1245 and £1250, while three months ago changed hands at £1210 and £1215.

Wolfram Up Again

A further increase in the price of wolfram was made in London on 19 January. The range quoted was 490s. to 510s. nominal per unit, c.i.f., compared with a previous range of 475s. to 485s. nominal.

Steel Board Headquarters

The Iron and Steel Corporation announces that it will move into its new headquarters at 1 Chester Street, London, on 15 February. The corporation will be entirely decentralised. The board will not be executive, and the management of the individual steel firms will be left in the hands of the existing directors. Mr. S. J. L. Hardie, chairman of the corporation, is expected to make a public statement before vesting day.

Money for Chemistry Research at Edinburgh

The Rockefeller Foundation has given $17,000 to the chemistry department of Edinburgh University for the purchase of special equipment obtainable only in America. The apparatus is for research in organic chemistry, with special reference to carbohydrates. The grant has been made principally because of the work of the chemistry department in connection with the relationship of organic chemistry to agriculture, the Foundation being keenly interested in agricultural research.

Advice on Heat Treatment

Modern heat treatment processes have an increasingly wide range of application in industry, but in order to obtain the best results from the most economic methods it is often advisable to get expert advice. For many years Standard Telephones & Cables, Ltd., has manufactured machines and equipment for specialised heat processing. A heat treatment group, located at Footscray, Kent, has now been formed by the company to give its assistance in up-to-date processes and methods. A well-equipped laboratory is available to which problems can be sent for investigation. Results are embodied in a report which includes recommendations as to method, type of equipment and approximate price.

OVERSEAS

Plastic Cinema Screen

A screen made of firestone velon, claimed to be the first available to the cinema industry, has been installed in the Radio City music hall, New York. Velon plastic is a glazed vinyl in 12 gauge. It contains chemical components to resist stains or chemical change, and is pigmented throughout to give it a bright white surface to provide reflection.

Dechema 1951

The general meeting of the Dechema 1951 will be held at Frankfurt am Main from 27-30 May, in conjunction with a Dechama Informational Convention. It is expected that the first invitations will be sent out at the end of January.

The Achema 10 exhibition will be held in conjunction with the General Meeting of the Dechema at Frankfurt am Main, at the end of May, 1952.

Pressurised Fire Extinguisher

A pressurised extinguisher designed to smother dangerous fires in metals has been developed by the Ansul Chemical Co., of Parinette, Wisconsin. The extinguisher expels a dry powder known as met-X which forms a crust over the metal. It is claimed to be moisture-proof, non-toxic, non-corrosive and non-abrasive. The device is reported to have been effective against fires in magnesium, sodium, potassium, zinc, and powdered aluminium.

Second U.S. Pyrenone Venture

A second plant for the production of pyrenone protectants, insecticides used to combat insect infestation in wheat and other grains, will be erected in Kansas City, Kansas, by U.S. Industrial Chemicals, Inc. The plant will have a capacity of 30 million lb. per annum and will supplement the output of grain insecticides at the company's Baltimore plant.

Dutch Milkwool Experiment

The experimental stage in production of Dutch milkwool at Casolana is now nearing completion. British textile factories are said to be highly satisfied with the quality of this Dutch milkwool which some consider the best synthetic fibre for the woollen industry. It is claimed that it can be easily dyed and does not show the stiffness of other synthetic wool fibres. The price is about one-third of the present wool costs.

Norwegian Aluminium Project

Plans are being considered for a new aluminium plant in Western Norway. Output is expected to reach 40,000 tons annually, according to reports from Oslo, and production might start in 1954.

New U.S. Cellophane Plant

It is anticipated that the plant now being built at Pisgah Forest, North Carolina, by Olin Industries, Inc., will be in operation by September this year. Production is expected to be of the order of 33 million lb. annually. Du Pont patents and technical knowledge will be used.

Israeli Fertiliser Plants

Part of the second credit of 35 million dollars, recently granted to Israel by the Export-Import Bank of Washington, is to be used to erect additional chemical fertiliser plants. The output from these plants will supply increasing home needs, and provide a surplus for export.

Potash Deposits in Canada

Development of the recently-discovered potash deposits owned by the Crown is being encouraged by the Department of Natural Resources of Saskatchewan. Permits to explore for potash deposits on land, the mineral rights of which are owned by the Government, will now be considered by the department.

Polish Zinc for India

Polish zinc, zinc dust and sheets are among the products to be supplied to India under the terms of the trade agreement ratified at the beginning of this month. Exports from India will include iron ore, manganese ore, mica, tin, chemicals and shellac.

Chemicals and Dyes for Austria

Under the terms of a new Franco-Austrian trade agreement recently concluded in Vienna, Austria will receive French chemicals, dyes, fertilisers, ferro-alloys and machinery. Austrian exports to France will include steel and steel products, and calcium nitrate.

Belgian Patents to be Microfilmed

The Belgian Ministry of Economic Affairs is to microfilm all Belgian patent specifications, said to number about 500,000, and to produce a photostat copy of each patent. The work which will take three years, follows agreements under which Belgium will supply these documents to the International Patent Office in The Hague.

Next Week's Events

TUESDAY, 30 JANUARY

Society of Dyers and Colourists

Manchester: Reynolds Hall, College of Technology, 6.30 p.m. (Manchester Junior Branch). F. W. Bradley: "The Application of Metallisable Dyestuffs."

Institute of Fuel

London: Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1. 5 p.m. "Drying Technique," fourth meeting in a series on "A Study of Drying." Subsidiary papers on: instrumentation, heating by electrical elements and drying of air and gases.

Society of Instrument Technology

London: Manson House, Portland Place, W.1. 6.30 p.m. K. J. B. Wolfe and P. Spear: "The Machining of Small Instrument Parts."

Second National Packaging Exhibition

London: National and Empire Halls, Olympia. (until 9 February).

WEDNESDAY, 31 JANUARY

The Chemical Society

Dublin: University College, Upper Merrion Street, 7.45 p.m. Professor T. S. Wheeler: "William Higgins (1763-1825)."

Royal Institute of Chemistry

Manchester: Gas Showrooms, Town Hall, 6.15 p.m. (Manchester and District Section). Annual general meeting, 6.45 p.m. Professor R. E. Lane: "Men and Machines."

British Association of Chemists

London: Wellcome Research Institute, 183 Euston Road, N.W.1, 7 p.m. (London Section, in conjunction with the Scientific Film Association). Display of scientific films.

THURSDAY, 1 FEBRUARY

The Chemical Society

Bangor: University College of North Wales, 5.45 p.m. (with University College of North Wales Chemical Society and University of Liverpool Chemical Society). Professor C. A. Coulson: "What is a Chemical Bond?"

Hull: University College, 6 p.m. (with University College Scientific Society). Professor E. D. Hughes: "The Comparative Chemistry of Carbon and Silicon."

Sheffield: University, 5.30 p.m. (with University Chemical Society). Professor C. E. H. Bawn: "Catalysed Oxidations."

Royal Institute of Chemistry

Liverpool: University, 7 p.m. Dr. D. W. Kent-Jones: "The Miller, the Baker, and Bread throughout the Ages."

Nottingham: Technical College, 7.15 p.m. (East Midlands Section, with SCI). Students' Lecture: R. A. Wells: "Chromatography."

Poole: British Drug Houses, Ltd., 6.30 p.m. Display of scientific films.

Stockton-on-Tees: William Newton School, Junction Road, Norton, 7.30 p.m. Professor M. G. Evans: "Electron Transfer Reactions."

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. J. T. R. Randall: "An Experiment in Biophysics."

FRIDAY, 2 FEBRUARY

The Chemical Society

Swansea: University College, 5.30 p.m. (with University College, Swansea Chemical Society). Professor C. A. Coulson: "What is a Chemical Bond?"

Textile Institute

Glasgow: Royal Technical College, George Street, 7.15 p.m. (with SCI). W. R. Weigham (Courtaulds, Ltd.): "Chemical Engineering in the Viscose Rayon Industry."

The Royal Institution

London: 21 Albemarle Street, W.1, 9 p.m. Professor E. N. da C. Andrade: "High Vacuum."

Fertiliser Productivity Team

IN order to publicise the report of the Fertiliser Productivity Team which visited the U.S.A. at the end of 1949 and whose findings were published in August, 1950, a series of meetings is now being held in London, Liverpool, Glasgow, Edinburgh, Bristol, Hull and Ipswich.

The meetings have been arranged jointly by the employers, the trade association and the trade unions, and are being attended by parties of workers from the production committee and works councils.

A film of the tour is being shown and the meetings addressed by Mr. J. H. Smith, leader of the team, and others.

The sponsors of the meetings are the Association of Chemical and Allied Employers and the Fertiliser Manufacturers' Association.

Rise in British Chemical Prices

Shortages Reflected in Upward Trend

London.—Practically all sections of the chemicals market report a strong price position and an active demand, and in many directions the weight of buying orders is much in excess of supplies. The full effect of the raw material shortages, particularly sulphuric acid, is now being felt, and the export trade in chemicals must inevitably suffer if the essential needs of the home market are to be met. A strong demand persists for the potash chemicals and the soda compounds are being called for up to the full extent of contracts. In the coal tar products market the supply position generally remains difficult with spot offers almost non-existent.

Manchester.—There has been a brisk demand for almost all descriptions of heavy chemical products on the Manchester market during the past week. Delivery specifications of textile bleaching, dyeing and finishing chemicals have been circulating freely and there has been pressure of supplies from the other leading consuming outlets. The scarcity of sulphuric acid and of a number of other products, in some instances due to the shortage of acid itself, is reported to be causing some inconvenience to the using industries. There is a fairly steady demand for most of the fertiliser materials and continued buying interest is reported in the market for the tar products.

Glasgow.—The sulphuric acid and sulphur position is now more or less defined and the minor points regarding distribution are expected to be cleared up during the next few days. Business remains steady, consistent with the large number of inquiries for forward delivery. The export market in many instances is almost at a standstill owing to home demands.

Price Changes

Rises: Ammonium persulphate, ammonium phosphate, barium carbonate, barium chloride, copper sulphate, cream of tartar, phosphoric acid, caustic potash, potassium carbonate, sodium metaphosphate, sodium phosphate, tartaric acid, zinc oxide, carbon tetrachloride, lithopone, carbolic acid, cresylic acid, naphthalene, pitch, pyridine, ammonium sulphate, compound fertilisers.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £69; 80% pure, 1 ton, £74; commercial glacial 1 ton, £82; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £118 per ton.

Acetone.—Small lots: 5 gal. drums, £105 per ton; 10 gal. drums, £100 per ton. In 40/50 gal. drums less than 1 ton, £85 per ton; 1 to 9 tons, £84 per ton; 10 to 50 tons, £83 per ton; 50 tons and over, £82 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 5d. per proof gallon; 5000 gal. lots, d/d, 2s. 6½d. per proof gal.

Alcohol, Diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums; 1 ton lots £47 per ton.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate. — MANCHESTER: £5 5s. 6d. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £88 and £86 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots as to grade, etc., 1s. 9½d. to 2s. 4½d. per lb. Crimson, 2s. 6½d., to 3s. 3½d. per lb.

Arsenic.—Per ton, £44 5s. to £47 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £28 5s. per ton, bag packing, ex works.

Barium Chloride.—£38 to £38 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid : Anhydrous, £54 ; in 1-cwt. bags, commercial, granular, £34 10s. ; crystal, £37 ; powder, £38, extra fine powder, £39 ; B.P., granular, £44 ; crystal, £46 ; powder, £48-£48 10s. ; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid : Commercial, granular, £62 ; crystal, £69 ; powder, £66 10s. ; extra fine powder, £68 10s. ; B.P., granular, £75 10s. ; crystal, £81 ; powder, £78 10s. ; extra fine powder, £80 10s.

Butyl Acetate BSS.—£156 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£143 per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4-ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Per lb., d/d buyers' premises, for 5 cwt. or over, anhydrous, 1s. 7d. plus 10%, other, 1s. 7d. ; 1 to 5 cwt., anhydrous 1s. 7½d. plus 10%, other 1s. 7½d. Higher prices for smaller quantities. All subject to a trade discount of 5%.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER : 2s. per lb.

Copper Chloride.—(63%), d/d, 2s. 2d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(63%), d/d, 2s. 1d. per lb.

Copper Sulphate.—£69 15s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £9 17s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £114 per ton.

Formaldehyde.—31 per ton in casks, according to quantity, d/d. MANCHESTER : £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1,260 s.g. 227s. 6d.—230s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb. ; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb. ; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iodoform.—21s. per lb.

Iron Sulphate.—F.O.R. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £105 per ton ; dark tech., £95 per ton ex works ; barrels returnable.

Lead Acetate.—White : £146 10s. per ton.

Lead Carbonate.—Nominal.

Lead Nitrate.—£127 10s. per ton.

Lead, Red.—Basis prices per ton : Genuine dry red lead, £154 ; orange lead, £166. Ground in oil : red, £173 10s. ; orange, £185 10s.

Lead, White.—Basis prices : Dry English, in 8-cwt. casks, £161 per ton. Ground in oil : English, under 2 tons, £177 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton ; grey, 80-82%, ton lots, d/d, £22 to £25 per ton.

Litharge.—£154 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £74 5s. ; cwt. lots £82 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d, £187 ; cwt. lots £192 10s. per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 10s. 8d. ; smaller quantities dearer.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 2d. per gal. ; pyridinised 64° O.P. 100 gal., 4s. 4d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £146 per ton, packed in 5-cwt. lots, packed in free 5-cwt. casks.

Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1-ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £67 10s. per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 2½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d ; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £88 10s. per ton for 1-ton lots ; flake, £105 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate.—Crystals and granular, 9⅜d. per lb. ; ground, 10⅜d. per lb., for not less than 6 cwt. ; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £88 10s. per ton for 1-ton lots, ex store ; hydrated, £81 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96%, 6-ton lots, £16 10s. per ton.

Potassium Iodide.—B.P., 15s. 5d. per lb. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 6d. per lb. ; technical, £6 13s. to £7 13s. per cwt. ; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s. per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER : 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic.—Solid 76/77% ; spot, £18 4s. per ton d/d.

Sodium Acetate.—£49-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb. ; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite.—Powder, 60/62%, £29 12s. 6d. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100% basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £23 2s. 6d. a ton ; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 16s. 9d. per lb., in cwt. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £114 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98%, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £34 10s., anhydrous, £65 ; tri-sodium, crystalline, £32 10s., anhydrous, £70.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums ; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton ; pea crystals, £20 10s. per ton d/d station in kegs ; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

Sulphuric Acid.—168° Tw., £7 5s. 6d. to £8 5s. 6d. per ton ; 140° Tw., arsenic free £5 10s. per ton ; 140° Tw., arsenious, £5 2s. 6d. per ton ; Quotations naked at sellers' works.

Tartaric Acid.—Per cwt. : 10 cwt. or more, £12.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d (56-lb. bags), £122 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d ; white seal, £172 10s. ; green seal, £171 ; red seal, £170.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—About 20s. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£64 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb. ; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £54 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £12 17s.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. Special No. 1, £20 11s.

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works : 90's, 3s. 3d. ; pure, 3s. 5½d. ; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 1s. 1¾d. to 1s. 3½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER : Crystals, 11¾d. to 1s. 1½d. per lb., d/d crude, 5s. 4d., naked, at works.

Creosote.—Home trade, 8d. to 10½d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 4s. 0d. per gal. ; 99.5/100%, 4s. 10d. American, duty free, for export, 9s. 0d., naked at works. MANCHESTER : Pale, 99/100%, American, duty free, 7s. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots ; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra : higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £17 to £20 per ton according to m.p. ; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works ; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 115s. per ton f.o.r. suppliers' works ; export trade, 120s. per ton f.o.b. suppliers' port. MANCHESTER : £5 10s. f.o.r.

Pyridine.—90/160°, 23s. per gal. MANCHESTER : 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal. MANCHESTER : Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton ; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal. ; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediate and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—Nominal.

***o*-Cresol** 30/31° C.—Nominal.

***p*-Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb. ; 66/68° C., 1s.

***p*-Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb. ; P.G. 1s. 0½d. per lb.

***o*-Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

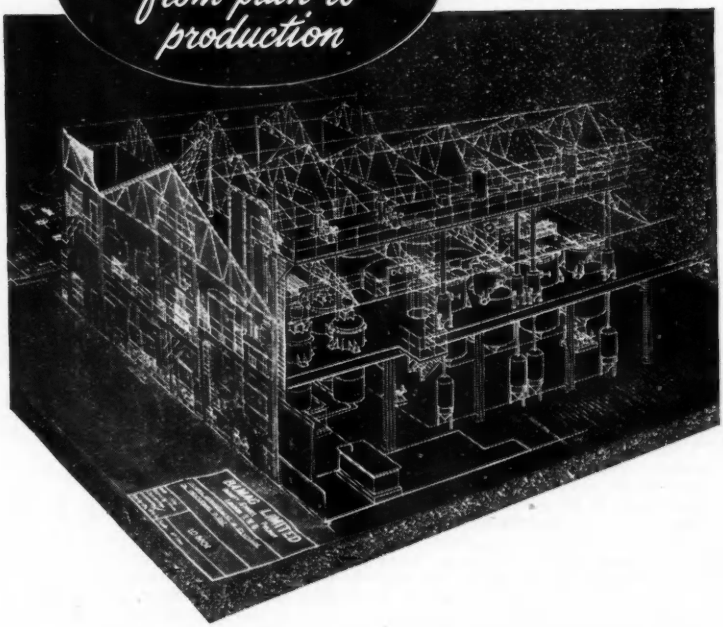
***p*-Toluidine.**—2s. 2d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

London : 23 January. The prices of unrefined oils remain unchanged for the five-week period ending 4 February, 1951. The prices of refined oils remain unchanged for the eight-week period ending 27 January, 1951.

CHEMICAL INSTALLATIONS *from plan to production*



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42

Chemical and Allied Stocks and Shares

THERE has been a waiting attitude in stock markets, which showed small movements in most sections, although they were mostly in favour of holders. The latest developments in the Far East which increased hopes of a "cease fire" in Korea, benefited sentiment; in contrast with firmness in industrial shares, however, British Funds were easier. The latter reflects a tendency to await any news of Government plans for meeting the cost of rearmament.

Higher taxation is regarded as inevitable. Part of the money is likely to come from a National Savings drive, and details are expected before long of a new issue of Savings Certificates. It is also considered likely in many quarters that there will be a large Defence loan issue. This seems unlikely until after next month's issue of nationalisation steel stock has been made. Meanwhile, however, the re-opening of Parliament may provide the Government with a means of giving some indication of its plans.

Although movements in chemical and allied shares were small, recent gains were mostly well maintained. Imperial Chemical changed hands round 43s. 6d. Monsanto were higher at 51s. 9d. on talk of the possibility of an increased dividend. Borax Consolidated at 61s. 10½d. have risen further pending the financial results, due next month. Fisons kept steady at 25s. 6d., Albright & Wilson were 15s. 4½d., F. W. Berk 12s. 6d. and Boake Roberts 31s. 6d.

Bowman Chemical 4s. shares were 5s. 6d., Amber Chemical 2s. shares 2s. 6d., and Brotherton 21s. 4½d., while Pest Control 5s. shares were 7s. 3d. Elsewhere, L. B. Holliday 4½ per cent preference kept at 19s. 6d., and Lawes Chemical ordinary shares were firmly held and quoted at 12s. Laporte Chemicals 5s. units moved up to 11s. 9d., and W. J. Bush £1 units to 87s.

United Molasses were active, and at 55s. 9d. held all but a small part of their further advance; the market is continuing to talk of prospects of a bonus which would write up the nominal value of the ordinary units from 6s. 8d. to £1. The 4s. units of the Distillers Co. showed activity round 21s. on market hopes of higher dividend prospects. Associated Cement were 87s. 3d., British Oxygen have been steady at 91s. 3d., and British Aluminium moved up to 41s. 9d. Dunlop Rubber were better at 56s. 9d., and Turner & Newall active round 89s.

A sharp rise in United Glass Bottle to 80s. 7½d. was due partly to higher dividend possibilities and partly to the view that tinplate shortage will lead to bigger demand for glass containers. Triplex Glass at 24s. 9d. were firmer on news that the company has extended its interests to engineering by the acquisition of two businesses.

British Glues & Chemicals 4s. units rose further to 23s. 1½d. Glaxo Laboratories have been active round 68s. 3d. on higher dividend hopes. Iron and steels were generally more active although most movements did not exceed more than a few pence. Guest Keen were 50s. 4½d., and Babcock & Wilcox were 68s. Staveley have further improved to 81s. 9d.

Boots Drug at 48s. 6d. showed firmness, Sangers were 23s., Griffiths Hughes improved to 22s., and Beechams deferred were 13s. 7½d. Textile shares kept active with Bradford Dyers at 27s. 7½d. accompanied by talk of prospects of a bigger dividend. Calico Printers were 27s. 3d., and Bleachers 8s. 10½d.

Oils were prominent with British Borneo Pets. up to 4s. 10½d. on the record oil production in North Borneo. Shell were firm at 80s. and Anglo-Iranian improved £5¾. Lobitos at 71s. 3d. held the rise which followed the interim dividend news.

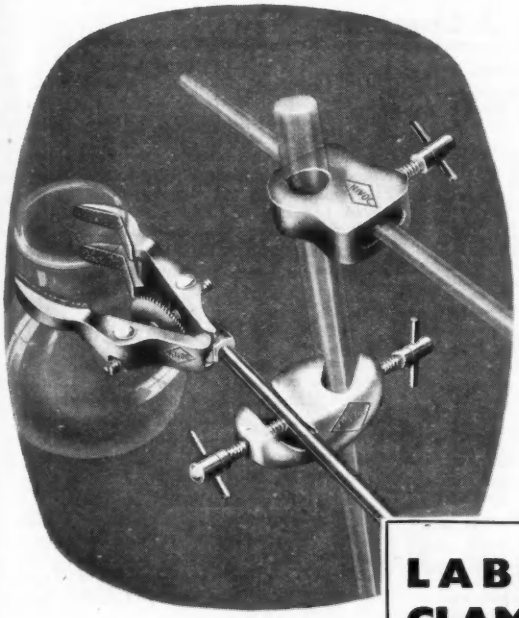
Varied Packaging Exhibits

A WIDE and varied programme is assured for all attending the Second National Packaging Exhibition, which begins at Olympia on Tuesday, 30 January. Forty-five of the 160 exhibitors will display the latest British, Continental and American machinery used in filling, labelling, closing and bottling.

There will be displays of the stages through which a package passes, from conception to completion. Some of the newest packages introduced in the U.S.A. will be shown and examples of time tested American packs will be on view.

Of especial interest is the mobile drum making factory, which occupies the entire ground floor of the Empire Hall.

There will also be a comprehensive series of talks, arranged by the Institute of Packaging, dealing with export, air transport and multiple store packaging, and culminating on 8 February, with a talk by American packaging experts visiting Great Britain under the Productivity Scheme.



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Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

A. S. BREWER & CO. (PLASTICS), LTD., London, E.C. (M., 27/1/51.) 13 December, £750 debentures, part of a series already registered.

Satisfactions

A. E. BREAKSPEAR, LTD., Maidenhead, chemists. (M.S., 27/1/51.) Satisfactions 14 December of mortgage registered 30 October 1947 and of charge registered 14 October 1948.

EVANS MEDICAL SUPPLIES, LTD., Liverpool. (M.S., 27/1/51.) Satisfaction 18 December of debenture stock registered 12 March 1943 to the extent of £12,000.

Increases of Capital

The following increases of capital have been announced: ROBERT STEWART & SONS, LTD., from £5000 to £10,000; LENDON (DORSET), LTD., from £5000 to £10,000; SEA CHEMICAL CO., LTD., from £750 to £12,000; ROBINSON BROTHERS, LTD., from £150,000 to £250,000; GLAXO LABORATORIES, LTD., from £1.5 million to £3 million; JEFFREYS, MILLER & CO., LTD., from £3000 to £22,000.

The capital of MAYS' CHEMICAL MANURE CO., LTD., has been increased from £30,000 to £60,000.

Company News

Redfern's Rubber Works, Ltd.

Net profit for 1950 is announced at £32,339 (£38,316 in 1949). The directors have recommended that the following dividends be paid on 15 March, in respect of the year 1950: 3½ per cent on the A and B preference shares, making 7½ per cent for the year; 5 per cent on the ordinary shares, making 10 per cent for the year, plus a bonus of 5 per cent.

Benn Brothers, Ltd.

The following dividends, payable on 15 February, 1951, have been declared by the directors of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE: Three per cent on the preference shares for the half-year ended 31 December, 1950, £1321 (same). Five per cent on the ordinary shares, £5244 (£3939), as increased by the issue of bonus shares in December, 1950; this must not be taken as indicating a higher total distribution for the year.

New Registrations

Dri-Vapour (Diffusers), Ltd.

Private company. (490,495). Capital £4000. Manufacturers of and dealers in all kinds of chemicals and appliances, etc. Subscribers: J. A. L. Stohrs, and G. T. Simpson. Reg. office: Carlisle House, 8 Southampton Row, W.C.2.

Thomas Favell & Co., Ltd.

Private company. (490,632). Capital £100. Manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Subscribers: T. J. Favell and A. R. Terry. Reg. office: 192 Seven Sisters Road, Finsbury Park, N.4.

North Hill Plastics, Ltd.

Private company. (490,622). Capital £500. Manufacturers of and dealers in plastic articles, etc. Directors: D. D. Mathieson and F. W. Culverhouse. Reg. office: 103 Cannon Street, E.C.4.

Rylatt & Allen, Ltd.

Private company. (490,471). Capital £1000. Manufacturers and merchants of and dealers in detergents and soaps, etc. Directors: T. Rylatt, and J. Allan. Reg. office: Streamline Garage, Brookes Street, Llandudno.

Changes of Name

The following changes of name have been announced: MAY-LYON, LTD., to M.L. (HOLDINGS), LTD.; STAFFORD SALT & ALKALI CO., LTD., to S.S. (HOLDINGS), LTD.; GEO. HAMLETT & SONS, LTD., to G.H. & S. (HOLDINGS), LTD.; QUICKSTRYP CHEMICAL CO., LTD., to Q.S. (HOLDINGS), LTD.; MANGER'S SALT WORKS, LTD., to M.S.W. (HOLDINGS), LTD.; ALFRED J. THOMPSON, LTD., to A.J.T. (HOLDINGS), LTD.; AGDEN SALT WORKS, LTD., to A.S.W. (HOLDINGS), LTD.; SHAKA SALT & CHEMICAL CO., LTD., to S.K. (HOLDINGS), LTD.

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Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Production of anthracene derivatives.—Neville Co. Nov. 22 1946. 647,466.

Gasoline hydrocarbons and process for the manufacture thereof.—A. H. Stevens. (Hydrocarbon Research, Inc.). Nov. 27 1946. 647,467.

Extruded tubing and methods and apparatus for the production thereof.—Extruded Plastics, Inc. May 9 1947. 647,479.

Heat-exchangers. — Hydrocarbon Research, Inc. June 5 1947. 647,483.

Fins for heat-exchangers.—Hydrocarbon Research, Inc. June 11 1947. 647,484.

Production of siliceous dispersions.—C. Shaw. June 11 1948. 647,528.

Manufacture of organo-halosilanes.—Dow Chemical Co. July 22 1947. 647,580.

Recovery of tar acids from coal oils or tars.—Low Temperature Carbonisation, Ltd., D. Horne, R. P. Marshall, and H. F. Bondy. July 20 1948. 647,487.

Production of hydrocarbons and oxygenated organic compounds.—M. W. Kellogg Co. July 25 1947. 647,489.

Heat-treating solids.—Erie Mining Co. July 30 1947. 647,490.

Recovery of salts of copper and tartaric acid from waste cuprammonium cellulose solutions.—American Bemberg Corporation. July 31 1947. 647,350.

Process for producing alkylated aromatic hydrocarbons.—Universal Oil Products Co. Aug. 6 1947. 647,493.

Styrene copolymers.—Pinchin Johnson & Co., Ltd., S. L. M. Saunders, and D. Schiller. Sept. 8 1948. 647,352.

Manufacture of light-sensitive silver halide emulsions.—N.V. Gevaert Photo-Producten, and A. E. Van Dormael. Oct. 11 1948. 647,354.

Liquids comprising silicyl esters.—D. A. W. Hill, C. Shaw and W. E. Oct. 18 1948. 647,537.

Process for the manufacture of 2-methyl-4-phenylbenzthiazole, methine dyes and sensitised photographic emulsions.—Kodak, Ltd. Nov. 13 1947. 647,542.

Manufacture of 1, 4-dicyano-2-butene.—E. I. Du Pont de Nemours & Co. Feb. 17 1948. 647,420.

Plant for circulating gases under high pressure.—Machinefabriek Geb., Stork & Co., N.V. Feb. 24 1948. 647,427.

Mountings for piezo-electric crystals.—Piezo Crystals, Ltd., A. W. Birt, and J. W. Richardson. Feb. 28 1949. 647,431.

Processes for coating metal surfaces.—Poor & Co. Nov. 24 1947. 647,543.

Chlorination of organic compounds.—Koninlijke Industrielle Maatschappij Voorheen Noury & Van Der Lande, N.V., and J. Diekmann. May 12 1948. 647,547.

Vitreous coating compositions for electric insulators.—British Thomson-Houston Co., Ltd. Jan. 28 1948. 647,414.

Removal of fluorine from hydrocarbon materials.—Phillips Petroleum Co. Feb. 10 1948. 647,419.

Process for the production of diamines.—N.V. De Bataafsche Petroleum Maatschappij. Feb. 26 1948. 647,432.

Production of dichlorodiphenyl-trichloroethane.—Pennsylvania Salt Manufacturing Co. Feb. 27 1948. 647,433.

Carbon mortar or carbon concrete.—C.D. Patents, Ltd., and A. Hilliard. March 10 1949. 647,440.

Bituminous compositions.—N.V. De Bataafsche Petroleum Maatschappij. March 12 1948. 647,563.

Alkaline dry cell and depolariser therefore.—Mallory Batteries, Ltd. March 22 1948. 647,362.

Process for reducing extensibility of nylon cords and the like.—Dunlop Rubber Co., Ltd., and J. W. Illingworth. March 22 1949. 647,289.

Production of oxygenated organic compounds from olefins.—D. T. Cross. (Standard Oil Development Co.). Nov. 18 1948. 647,363.

Methods for reducing sulphur content of coke.—United Steel Cos., Ltd., and L. Reeve. May 3 1949. 647,298.

Revivification of bone char.—Union Starch & Refining Co., and J. E. Cleland. May 20 1948. 647,367.

Electroplating.—Standard Telephones & Cables, Ltd., H. Wolfson, and B. Thomson. May 21 1948. 647,303.

Electrolytic process and apparatus.—I.C.I., Ltd., A. I. S. Duncan, and J. G. Moore. June 17 1949. 647,313.

Method of production of ammonium salts of the sulphamic acids.—Spolek Pro Chemickou A Hutni Vyrobu, Narodni Podnik. June 24 1948. 647,316.

Processing of rubber.—Monsanto Chemicals, Ltd., and W. M. Morgan. April 5 1949. 647,572.

Manufacture of crystalline sodium penicillin.—Distillers Co., Ltd., H. Tozer, and N. M. Cross. July 13 1949. 647,320.

Production of water-soluble cellulose compound.—Courtaulds, Ltd., F. Ward, and E. E. Tallis. July 26 1949. 647,321.

Preparation of polysiloxane resins.—British Thomson-Houston Co., Ltd. Aug. 6 1948. 647,322.

Production of dyestuffs of the anthraquinone series.—British Celanese, Ltd. (Celanese Corporation of America). Aug. 25 1949. 647,325.

Method for the mechanical properties of ferritic stainless chromium steels, and products resulting from the use of the said method.—Soc. Anon. des Etablissements J. Holtzer. Aug. 27 1948. 647,447.

Reaction products of acrylonitrile and keytone-aldehyde condensates.—United States Rubber Co. Sept. 22 1948. 647,382.

Production of sodium fluoride from sodium silicofluoride.—J. Wilkinson & Son, Ltd., and R. Y. Eagers. Sept. 5 1949. 647,395.

Plastic compositions and lacquers made therefrom.—Neville Co. Nov. 22 1946. 647,518.

Process for the manufacture of panthenol derivatives.—Roche Products, Ltd. (F. Hoffman-La Roche & Co.). June 29 1949. 646,758.

Production of aryldimethylchlorosilanes.—J. G. Fife. (Dow Corning Corporation). June 29 1949. 646,761.

Defoliation of plants.—A. H. Stevens (American Cyanamid Co.). March 23 1944. 648,371.

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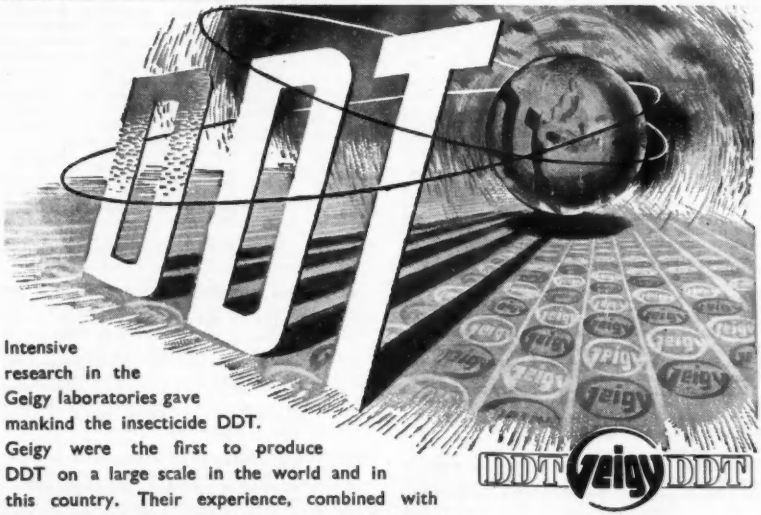

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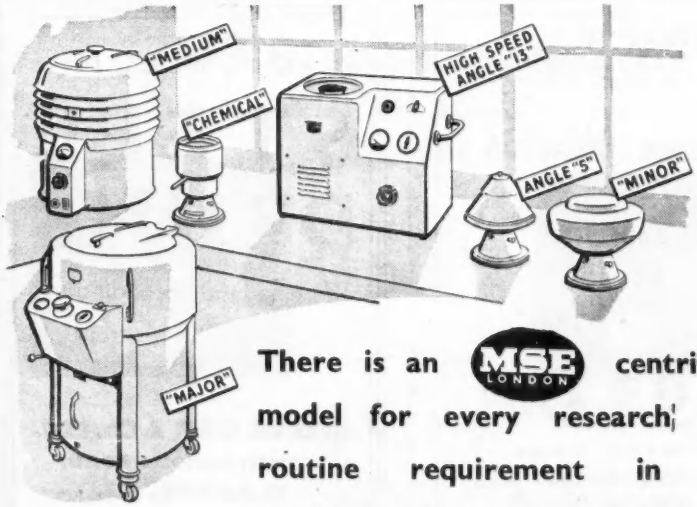

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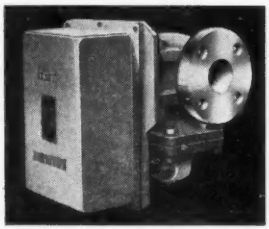

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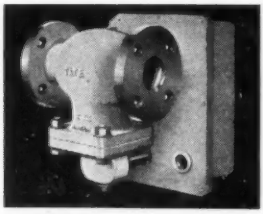

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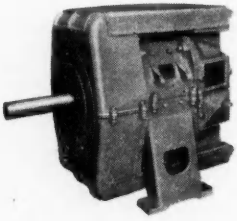

...to dirt and dust, acid splashes, corrosive fumes in gas works, boiler houses and coke oven plants

...When you employ
Metrovick TECAC Motors

The illustration shows a Metrovick TECAC direct-current motor with integral fan-operated air cooling circuits.

METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED TRAFFORD PARK MANCHESTER 17
Member of the A.E.I. group of companies
METROVICK Motors for all industrial drives

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